

Take a walk with us...



PRODUCT OVERVIEW

KNEE SYSTEMS

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from resurfacing ...



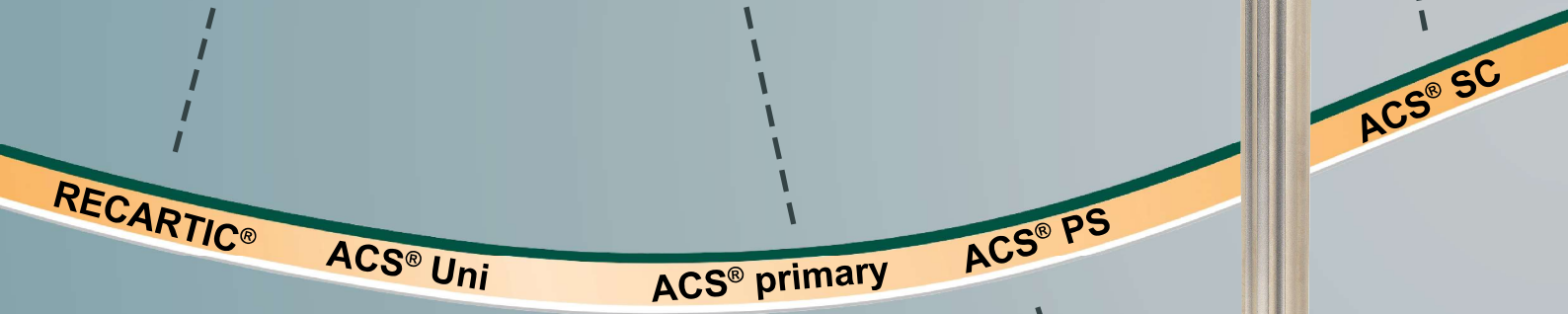
partial
resurfacing



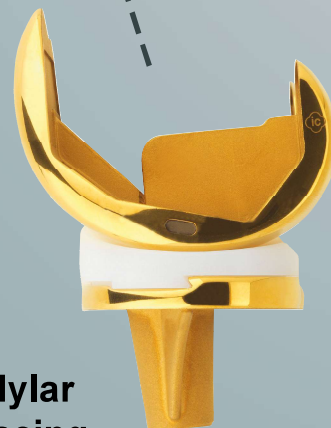
bicondylar
resurfacing



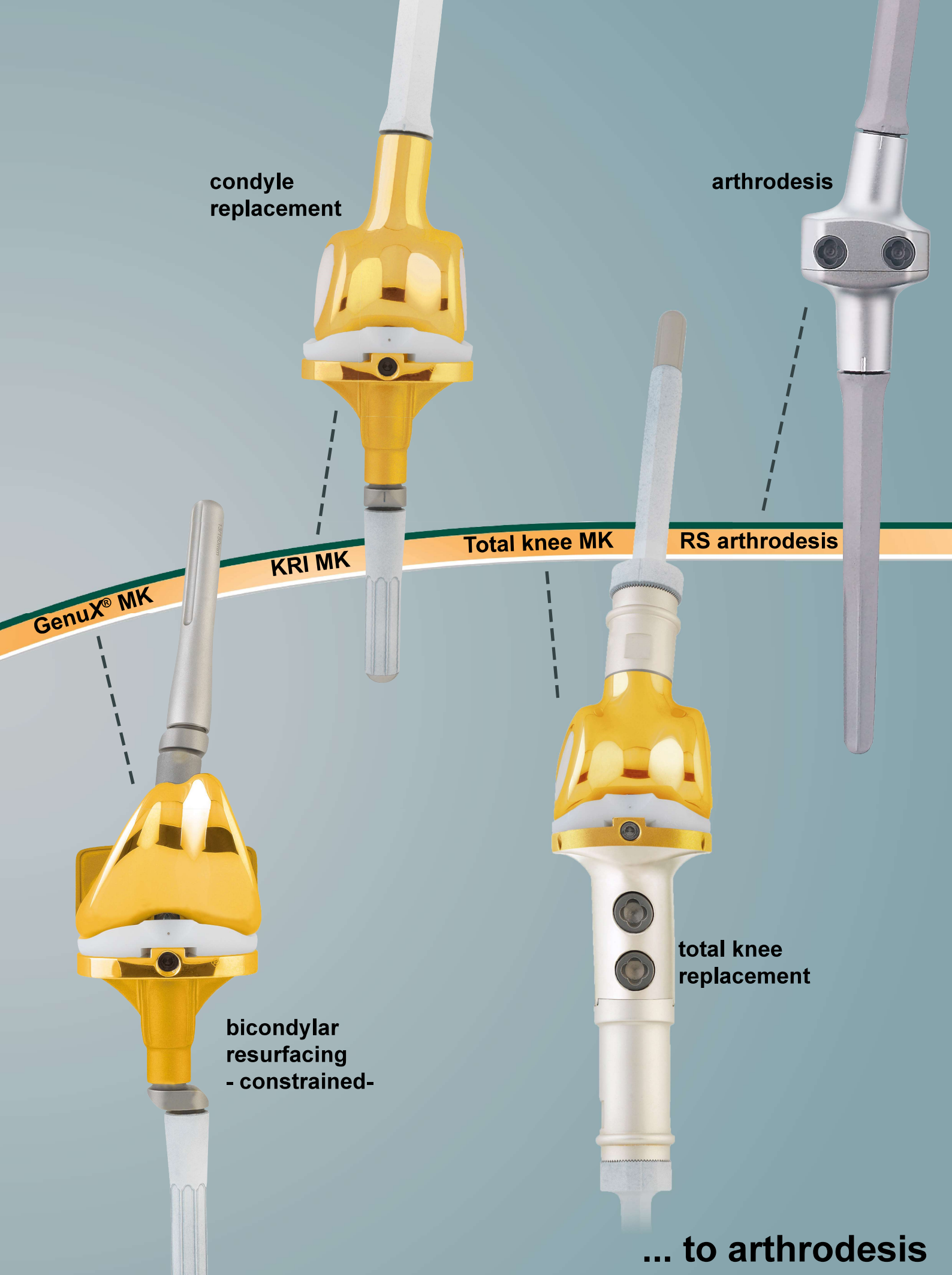
bicondylar
resurfacing
- semi constrained -

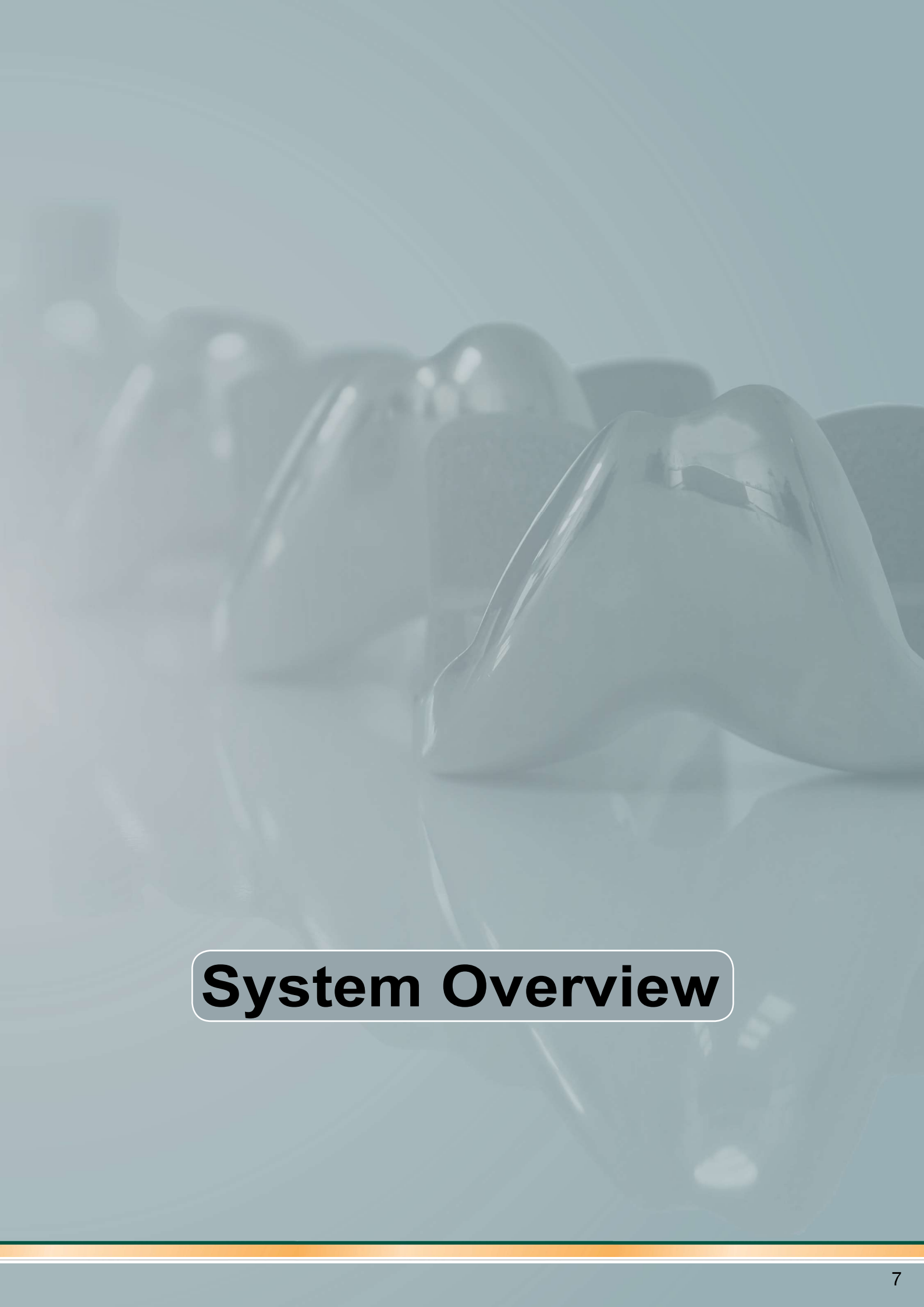


unicondylar
resurfacing



bicondylar
resurfacing
- posterior stabilized -

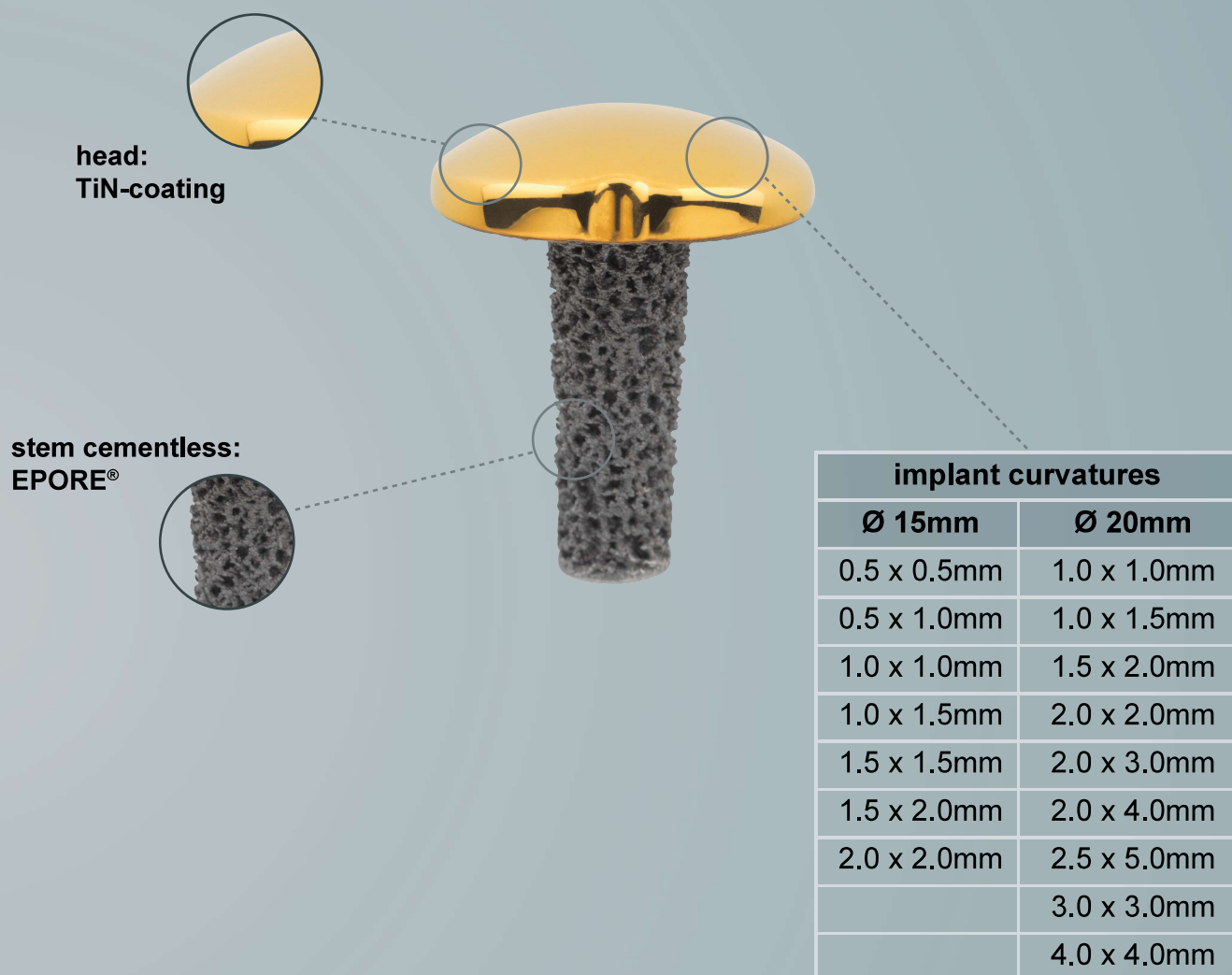


A row of shiny, metallic, bell-shaped objects, possibly bells or decorative pieces, arranged on a reflective surface. The objects are highly polished and reflect light, creating a series of highlights and shadows. The background is a soft, out-of-focus blue-grey color.

System Overview

RECARTIC®

- partial resurfacing -



Description:

RECARTIC® is a partial knee resurfacing system for degenerative or post-traumatic cartilage lesions. The implant is intended to replace localised damage to cartilage only while retaining or preserving the other healthy structures.

	Size range	Material
Implant head	Ø: 15mm and 20mm 16 curvatures	EPORE® with TiN-coating
Implant stem		EPORE®

ACS[®] Knee system

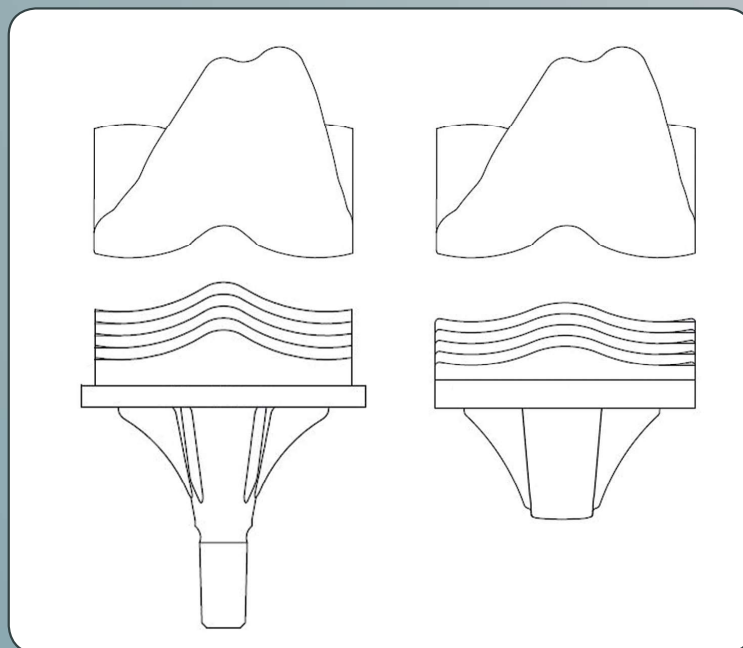
For several decades now the ACS[®] knee range has proven itself in the clinical setting on a world-wide basis. Continuous advancement has been made possible thanks to proactive ongoing co-operation with and extensive input from the users of the system.

Mobile Bearing - Fixed Bearing

Unlike most knee replacement systems the ACS[®] has the advantage of offering both mobile bearing (MB) and fixed bearing (FB) options across much of the range. The following brief notes should help in terms of implant choice:

MB knee designs have polyethylene inserts that feature non-congruent (i.e. essentially flat) undersides that are relatively free to rotate upon a non-congruent (i.e. essentially flat) upper surface of the corresponding tibial components. Because articulation can take place in two areas (i.e. between the femoral component and the polyethylene insert as well as between the polyethylene insert and the tibial component) joint stability in MB knees has to be built into the upper surface(s) of the polyethylene components thus they are highly congruent with femoral implant geometry - this is why MB insert size is driven by the size of the femoral component.

FB knee designs have polyethylene inserts with features on their underside that lock securely with features on the upper surface of the corresponding tibial component. Since there is no movement at this interface FB insert size is driven by the size of the tibial component. Mobility in FB knees is therefore built into the upper surface(s) of the polyethylene components thus they are less congruent with femoral implant geometry.



Templates Mobile Bearing and Fixed Bearing

Unicondylar joint replacement

The most bone preserving resurfacing options in the knee portfolio are designed to treat patients with unicompartmental arthritis. The surgeon can choose between a mobile bearing with the ACS® Uni or a fixed bearing with the PB Uni. In either the case the surgery is less invasive than for a total knee replacement. Both systems convince with their anatomical design and the minimal invasive implantations.

Bicondylar knee prostheses

Possibly the main benefit of the bicondylar ACS® femoral options is the seamless intra-operative inter-changeability between the primary, the posterior-stabilised (PS) and the semi-constrained (SC) revision prostheses for any given implant size. This advantage is due to the same bone-facing femoral implant contour regardless of the level of constraint or fixation method required, the same AP dimensions, ML dimensions and 15 degree distal femoral resection, the same multi-radius articular curvature and the same patella-friendly groove which is lateralised by 5 degrees.

Rotational stability is provided by two small pegs on the fixation surface of the primary femoral resurfacing option. The PS and SC femoral components feature an open box with a post that engages with a cam on the PE insert. The SC femur also has morse taper for stem extensions in 6 degrees of valgus.

When planning which FB tibial component would be best for the patient it is important to appreciate beforehand that the same asymmetrical option is used regardless of constraint indicated. Different sizes are of course available - each of which can be augmented with spacers and/or stems if required plus they accept symmetrical standard, Hyperflex, Ultra, PS and SC polyethylene inserts.

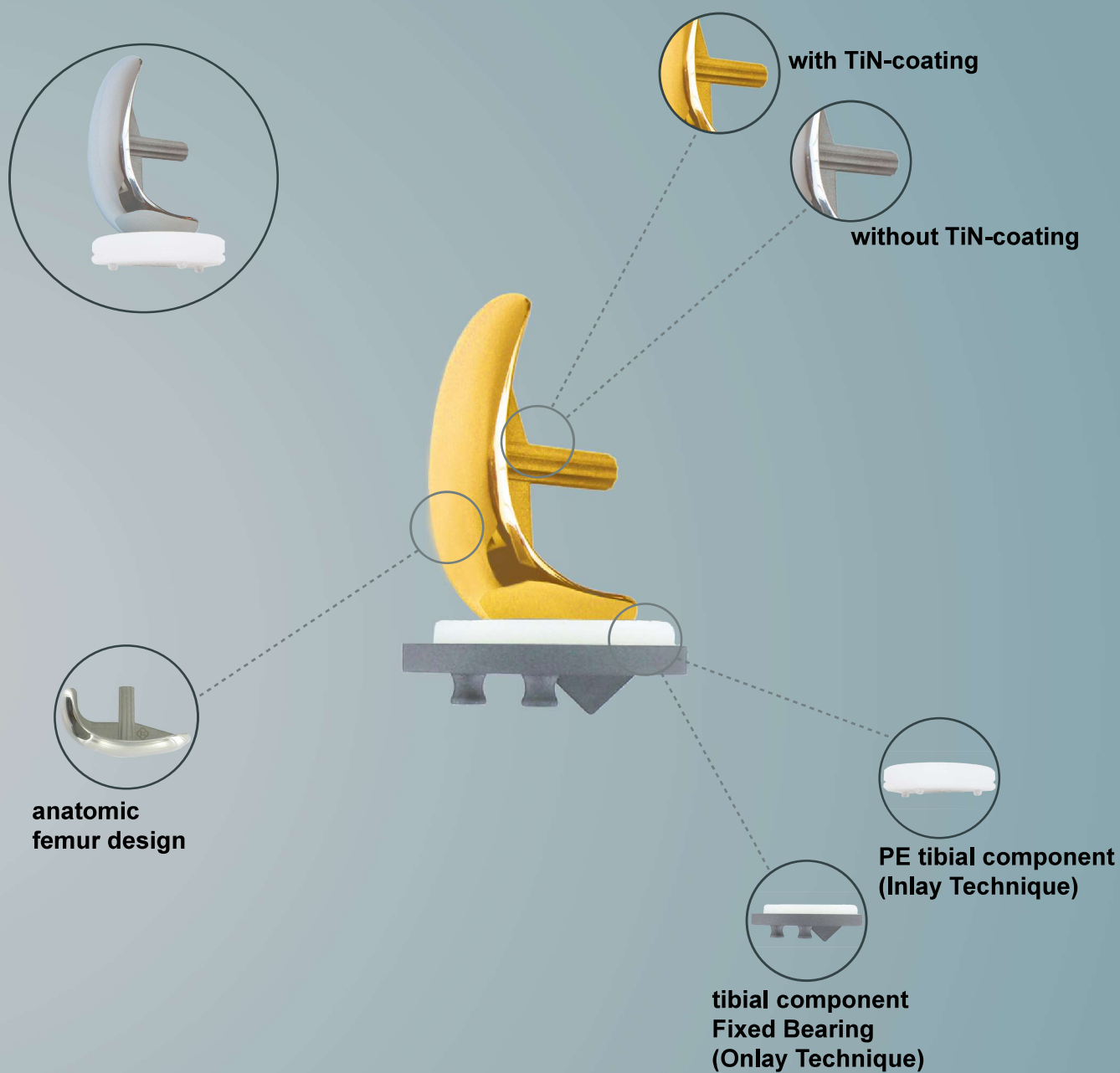
However there are three different MB tibial components to choose from. The first two options are Basic version and the Standard version which are both suitable for primary as well as PS implantations - but only the Standard version can accept a stem extension. The third option is the SC tibial component which will accept SC and non-constrained (NC) polyethylene inserts as well as spacers and/or stem extensions.

ACS® Uni



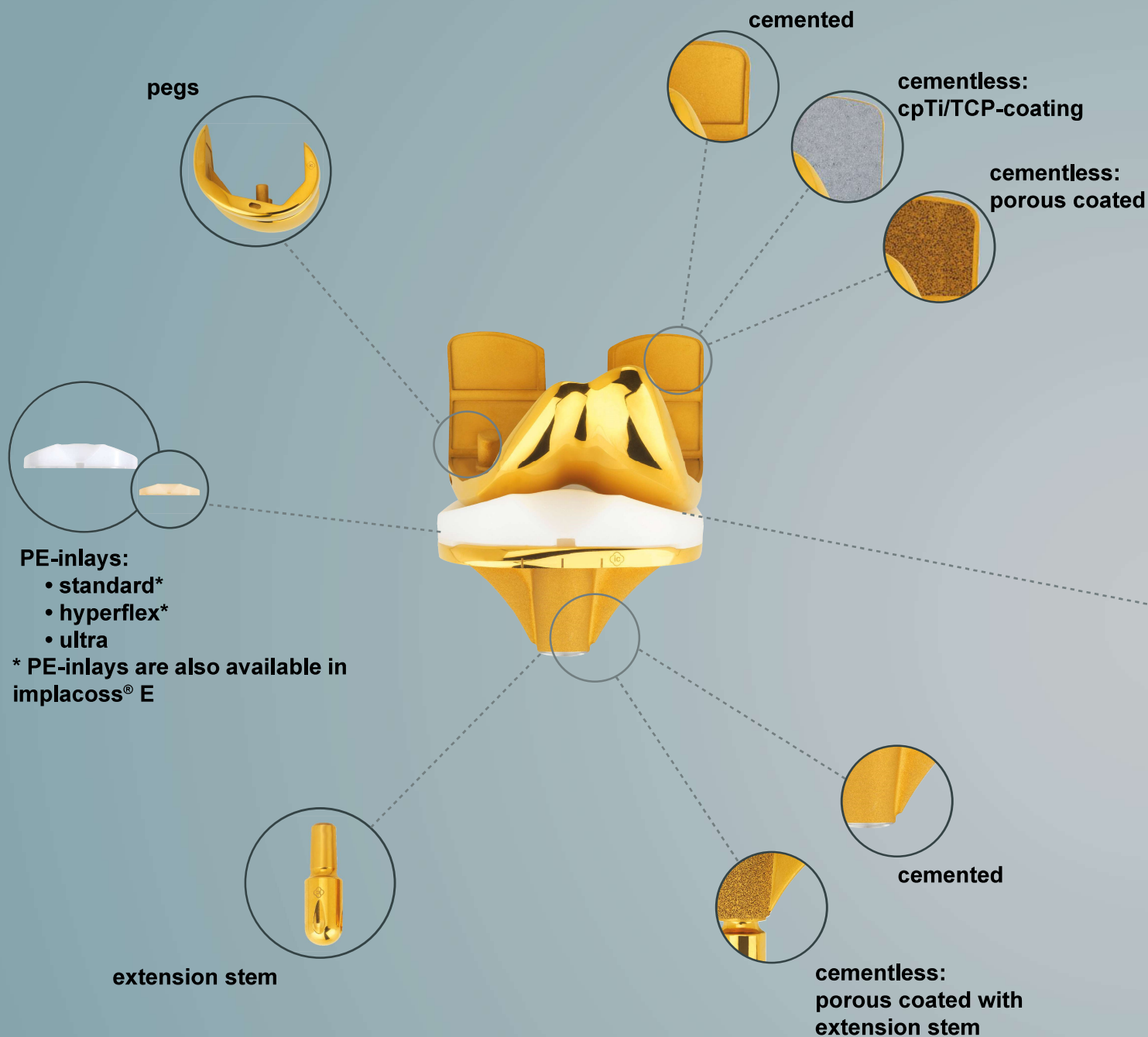
	Size range	Material
ACS® Uni femoral component	4 sizes	implavit® with TiN-coating
ACS® Uni PE-insert	height: 4mm - 12mm	UHMW-PE
ACS® Uni tibial component	8 sizes	implavit® with TiN-coating

PB Uni



	Size range	Material
PB Uni femoral component	4 sizes	implavit® (if need with TiN-coating)
PB Uni PE-insert	height: 8mm - 11mm	UHMW-PE
PB Uni tibial component	4 sizes	implatan®
PB Uni PE tibial component	height: 6.5 - 9.5mm	UHMW-PE

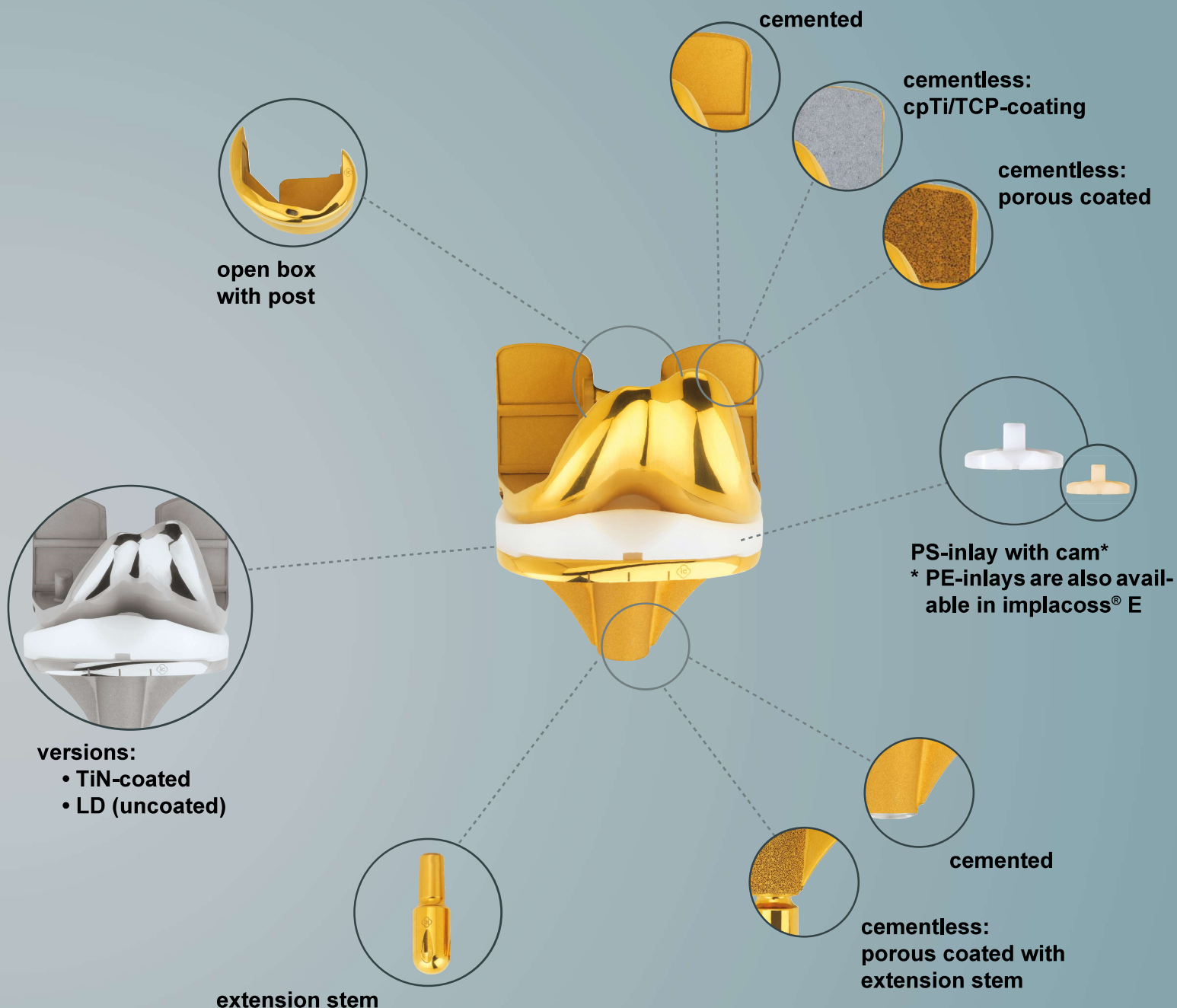
ACS[®] Fixed Bearing



	Size range	Material
ACS [®] femoral component	13 sizes (standard and slim)	implavit [®] (if need with TiN-coating)
ACS [®] FB PE-insert	Height: 10mm - 20mm	UHMW-PE, implacross [®] E
ACS [®] FB tibial component	6 sizes	implavit [®] (if need with TiN-coating)
ACS [®] FB extension stem	Length: 25, 35, 50mm	implatan [®] (if need with TiN-coating)

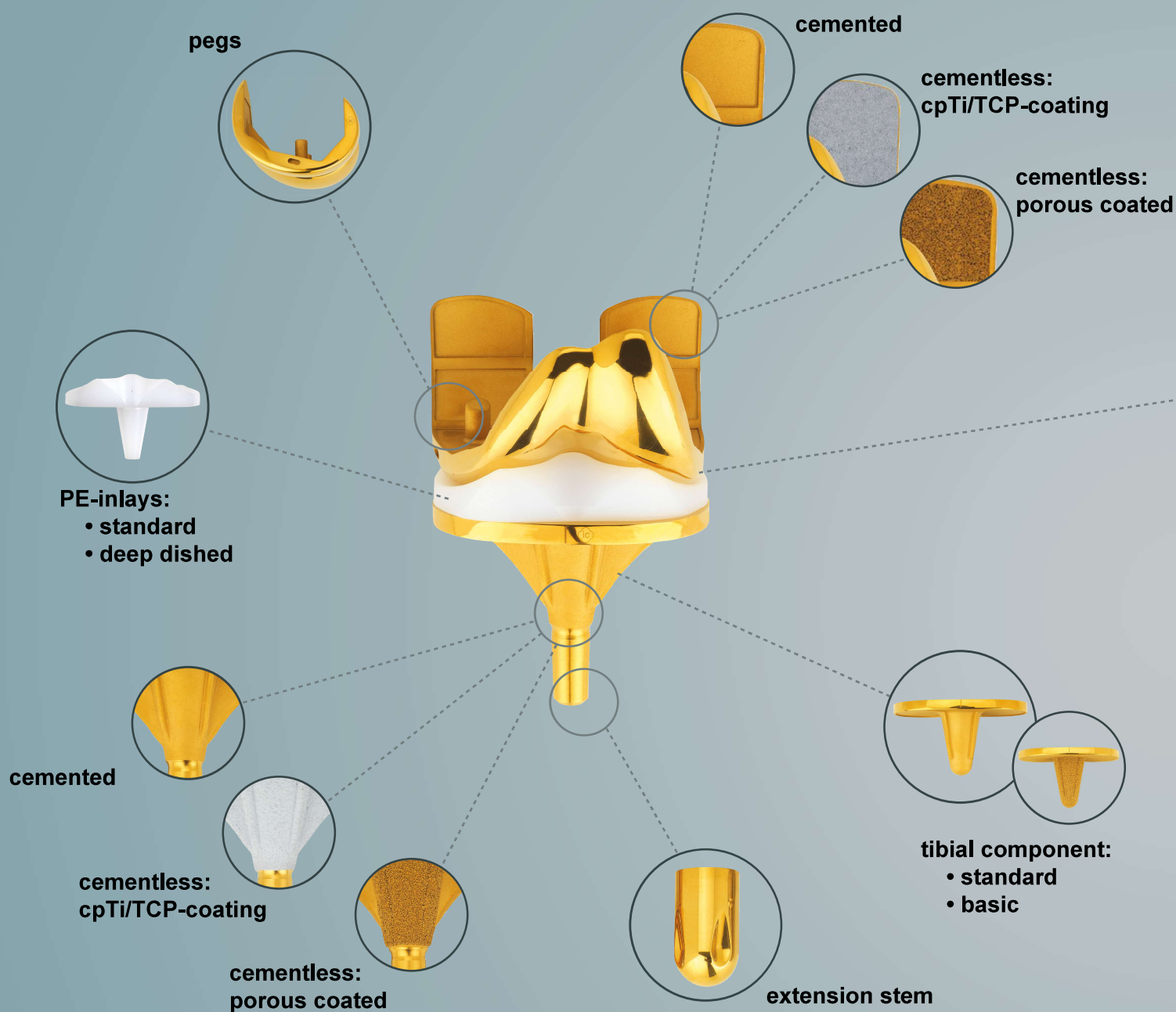
ACS[®] Fixed Bearing PS

- Posterior Stabilised -



	Size range	Material
ACS [®] femoral component	12 sizes (standard and slim)	implavit [®] (if need with TiN-coating)
ACS [®] FB PS PE-insert	Height: 10mm - 20mm	UHMW-PE, implacoss [®] E
ACS [®] FB tibial component	6 sizes	implavit [®] (if need with TiN-coating)
ACS [®] FB extension stem	Length: 25, 35, 50mm	implatan [®] (if need with TiN-coating)

ACS[®] Mobile Bearing



	Size range	Material
ACS [®] femoral component	13 sizes (standard and slim)	implavit [®] (if need with TiN-coating)
ACS [®] MB PE-insert	Height: 10mm - 20mm	UHMW-PE
ACS [®] MB tibial component	7 sizes	implavit [®] (if need with TiN-coating)
ACS [®] MB extension stem	Length: 25, 50, 75mm	implatan [®] with TiN-coating

ACS® Mobile Bearing PS

- Posterior Stabilised-

open box
with post

cemented

cementless:
cpTi/TCP-coating

cementless:
porous coated

versions:

- TiN-coated
- LD (uncoated)

PS-inlay with cam

cemented

cementless:
cpTi/TCP-coating

cementless:
porous coated

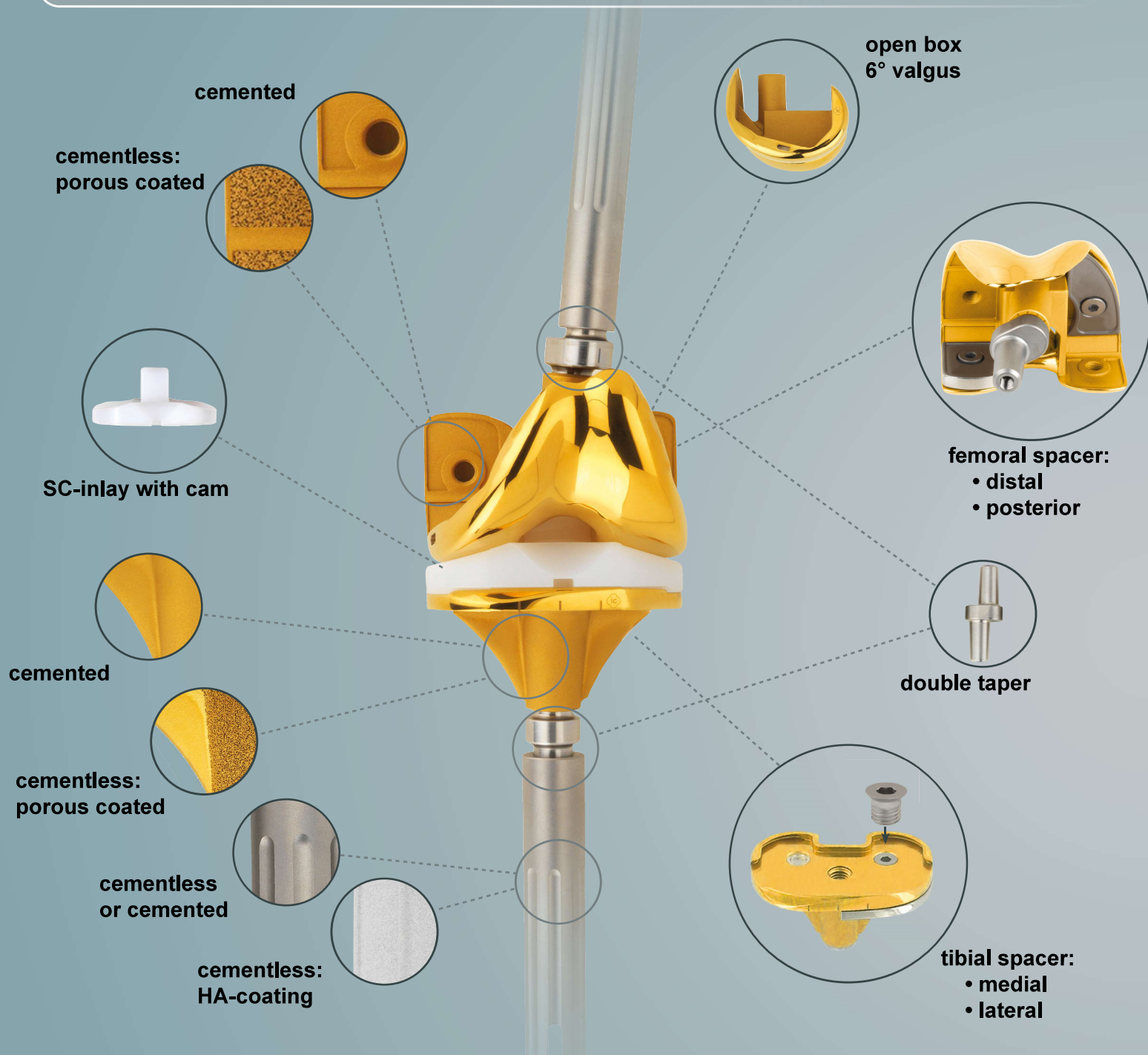
tibial component:
• standard
• basic

extension stem

	Size range	Material
ACS® femoral component	12 sizes (standard und slim)	implavit® (if need with TiN-coating)
ACS® MB PS PE-insert	Height: 10mm - 20mm	UHMW-PE
ACS® MB tibial component	7 sizes	implavit® (if need with TiN-coating)
ACS® MB extension stem	Length: 25, 50, 75mm	implatan® with TiN-coating

ACS[®] Fixed Bearing SC

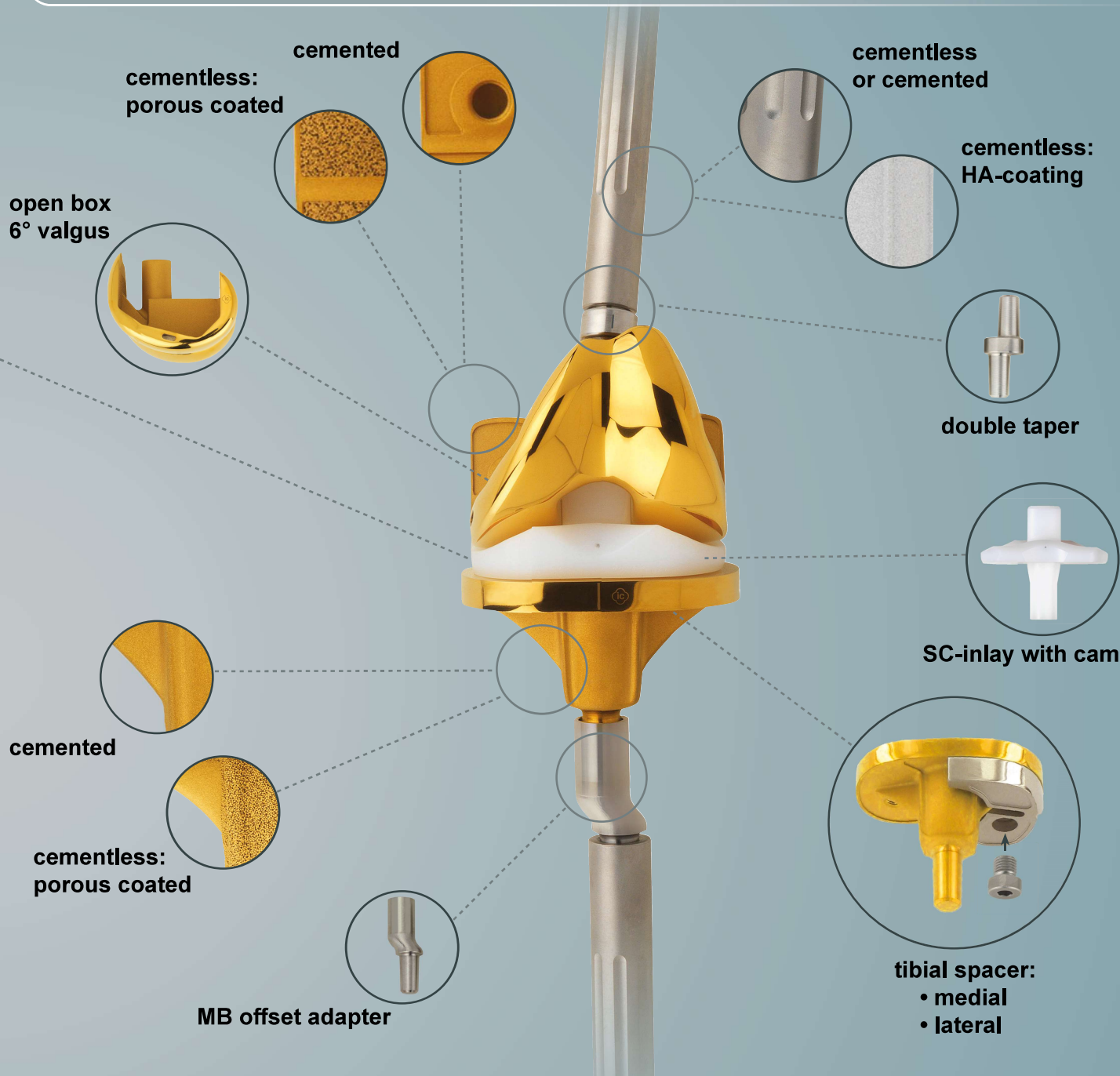
- Semi Constrained -



	Size range	Material
ACS [®] SC femoral component	6 sizes	implavit [®] with TiN-coating
ACS [®] FB SC PE-insert	Height: 10mm - 20mm	UHMW-PE
ACS [®] FB tibial component	6 sizes	implavit [®] (if need with TiN-coating)
ACS [®] stems (femoral and tibial)	Length: 100 - 200mm Ø: 12-22mm	implatan [®] (if need with TiN-coating)
Spacer	femoral (5mm-10mm) tibial (5mm - 10mm)	implatan [®]
Double taper	0, 2, 4 and 6mm	implatan [®]

ACS® Mobile Bearing SC

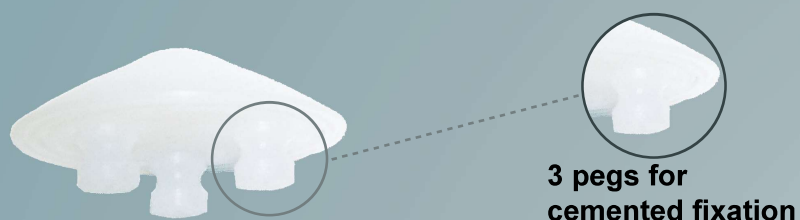
- Semi Constrained -



	Size range	Material
ACS® SC femoral component	6 sizes	implavit® with TiN-coating
ACS® MB SC PE-insert	Height: 10mm - 20mm	UHMW-PE
ACS® MB SC tibial component	5 sizes	implavit® with TiN-coating
ACS® stems (femoral and tibial)	Length: 100 - 200mm Ø: 12-22mm	implatan® (if need with TiN-coating)
Spacer	femoral (5mm-10mm) tibial (5mm - 10mm)	implatan®
Double taper femoral	0, 2, 4 and 6mm	implatan®
Offset adapter tibial	2 and 4mm	implatan®

ACS[®] Patella

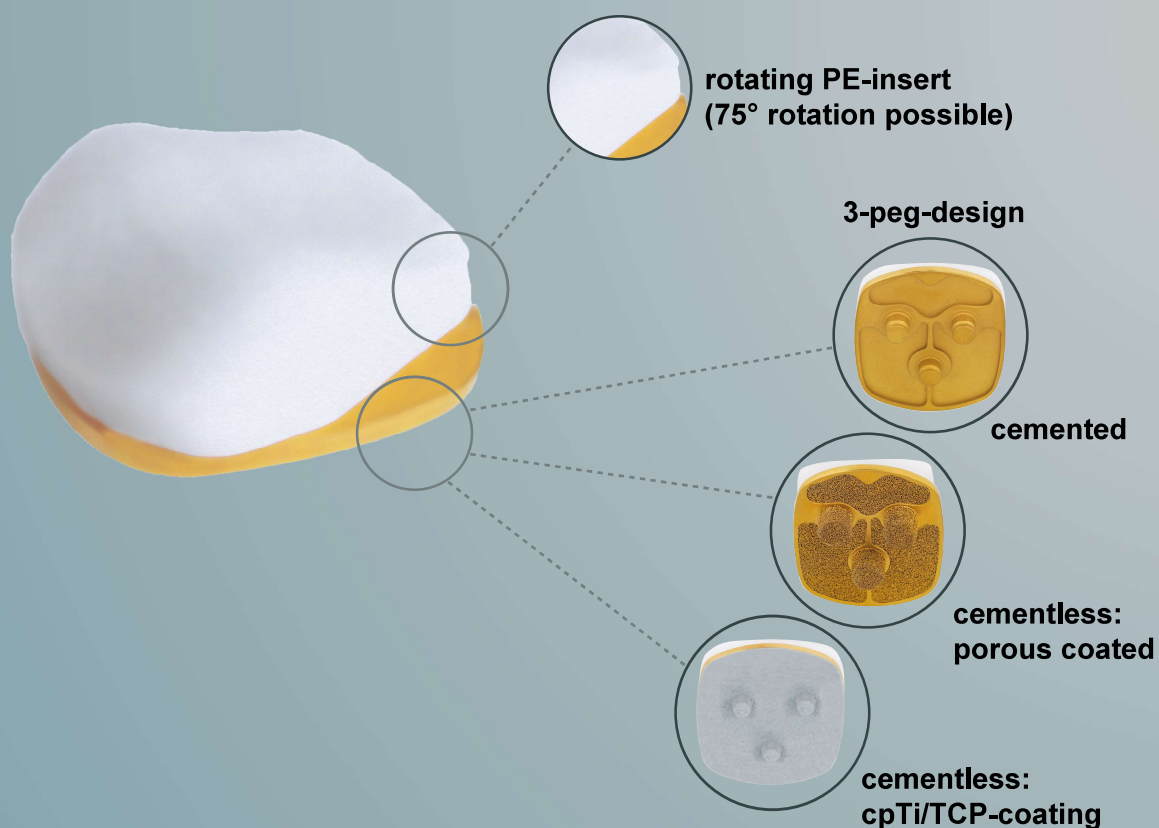
ACS[®] PE-Patella



**3 pegs for
cemented fixation**

	Size range	Material
ACS [®] PE-Patella	4 sizes Ø: 26, 29, 32 and 35mm	UHMW-PE

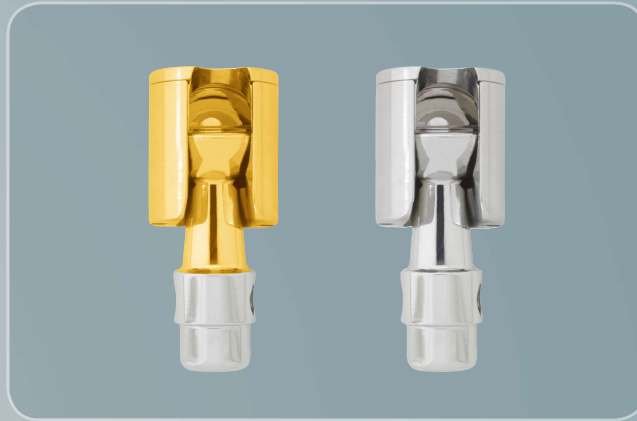
ACS[®] Rotating-Patella



	Size range	Material
ACS [®] Rotating-Patella	6 sizes	Base plate: implavit [®] (if need with TiN-coating) PE-insert: UHMW-PE

Hinge Knee System

The hinge knee system is characterised by a stable, but mobile, coupling that connects the femoral component to the tibial component. It is designed to substitute for poor/ absent ligament function.



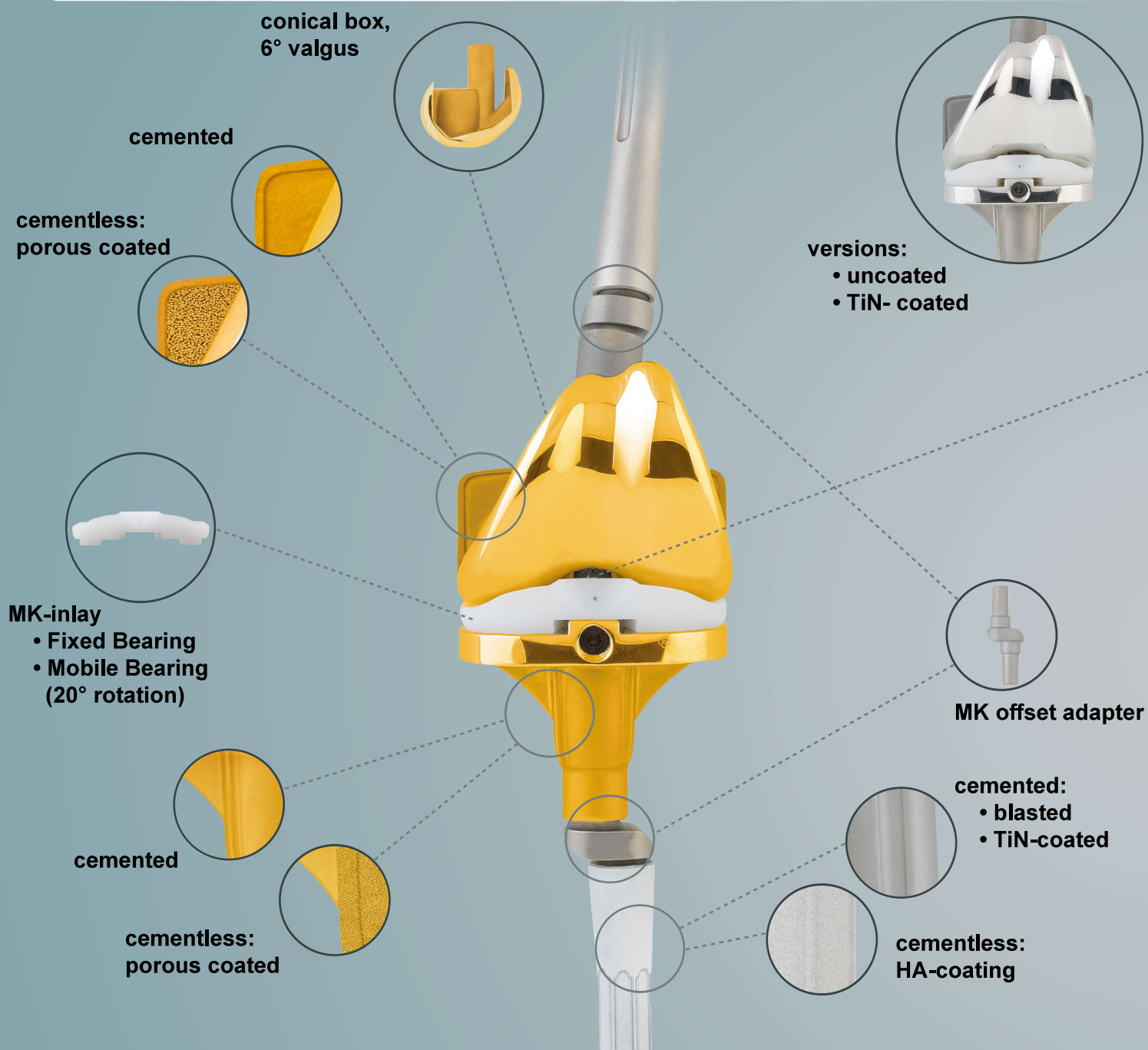
The pre-assembled MUTARS® GenuX® MK coupling is made from three parts (i.e. the cap, the bolt and the peg). It is designed to accommodate 130 degrees of deep flexion, 12 degrees of hyperextension and 20 degrees of axial rotation while offering stability. Compared to previous couplings, the current version exhibits no impingement between these parts.

One application of the MUTARS® GenuX® MK coupling is in combination with the rotation hinge prosthesis MUTARS® GenuX® MK. This revision system allows to treat various patients thanks to its modularity. The MUTARS® GenuX® MK system offers a medio lateral rotational freedom of 20° and as mentioned before a ROM of almost 145°.

Due to its compability to the MUTARS® tumor system and the EPORE® defect fillers, as well as its similarity to the ACS® SC the MUTARS® GenuX® MK allows the surgeon an easy interoperative change between the systems or the use of an additional component.

The MUTARS® GenuX® MK coupling is used for the MUTARS® KRI MK, too. This joint replacement is a whole reconstruction of the knee joint which substitutes the femoral condyles completely. Apart from the femoral component and stem this system is identical to the MUTARS® GenuX® MK. Again an interoperative switch between the systems is easy to realise.

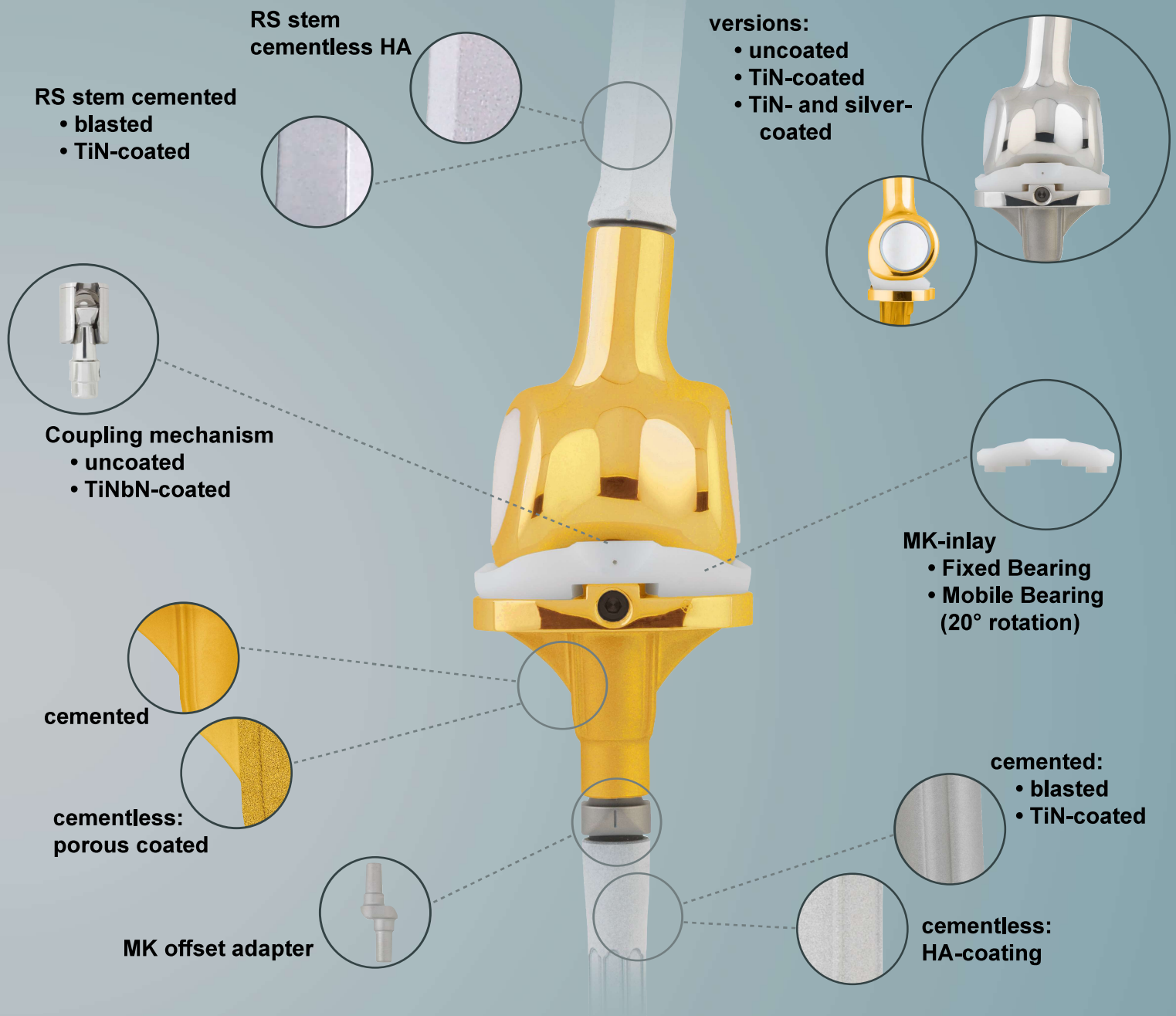
MUTARS® GenuX® MK



	Size range	Material
GenuX® MK femoral component	4 sizes	implavit® (if need with TiN-coating)
GenuX® MK PE-insert	Height: 12.5mm (MB, FB)	UHMW-PE
GenuX® MK tibial component	4 sizes	implavit® (if need with TiN-coating)
Coupling		CoCrMo (if need with TiNbN-coating)
GenuX® MK stems (femoral and tibial)	Length: 125 - 250mm Ø: 12-28mm	implatan® (if need with TiN- or HA-coating)
Spacer	femoral (5mm-10mm) tibial (5mm - 45mm)	implatan® (if need with silver-coating)
MK offset adapter	0, 2, 4 and 6mm	implatan®

MUTARS® KRI MK

- condyle replacement implant -



	Size range	Material
KRI femoral component	1 size	implavit® (if need with TiN-coating)
GenuX® MK PE-insert	Height: 12.5mm (MB, FB)	UHMW-PE
GenuX® MK tibial component	4 sizes	implavit® (if need with TiN-coating)
Coupling		CoCrMo (if need with TiNbN-coating)
RS stems femoral	Length: 120 - 250 mm Ø: 12-20mm	implatan® (if need with TiN- or HA-coating)
GenuX® MK stems tibial	Length: 125 - 250mm Ø: 12-28mm	implatan® (if need with TiN- or HA-coating)
Spacer tibial	5mm - 45mm	implatan® (if need with silver-coating)
MK offset adapter	0, 2, 4 and 6mm	implatan®

Other MUTARS® knee systems

MUTARS® ...

... Distal Femur MK



- Reconstruction length: min. 100mm
- Femoral: dist. Femur MK
- Tibial: GenuX® MK

... Proximal Tibia MK



- Reconstruction length: min. 115mm
- Femoral: GenuX® MK
- Tibial: Prox. Tibia MK

... Total Knee with KRI MK



- Reconstruction length: min. 165mm
- Femoral: KRI MK
- Tibial: Prox. Tibia MK

... Total Knee
with Distal Femur MK



- **Reconstruction length:**
min. 215mm
- **Femoral:** Dist. Femur MK
- **Tibial:** Prox. Tibia MK

... RS arthrodesis



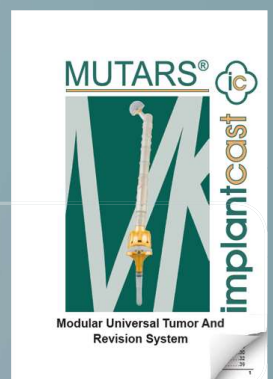
- **Reconstruction length:**
min. 90mm (30mm, if the
stem connecting portions
are inserted into the bone)

... arthrodesis
implant

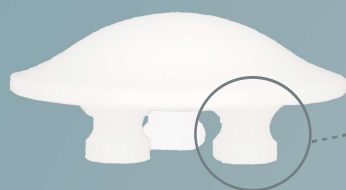


- **Reconstruction length:**
min. 145mm

Further information about the MUTARS® knee systems can be found in the over-
view brochure MUTARS® - Modular Universal Tumor And Revisions System.



MUTARS® Patella

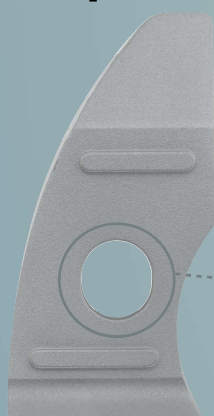


**3 pegs for
cemented fixation**

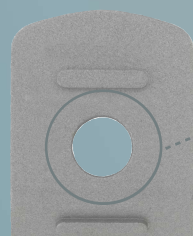
	Size range	Material
MUTARS® patella	2 sizes	UHMW-PE

MUTARS® MK Spacer

Femoral spacer



distal spacer:
• lateral
• medial



posterior spacer

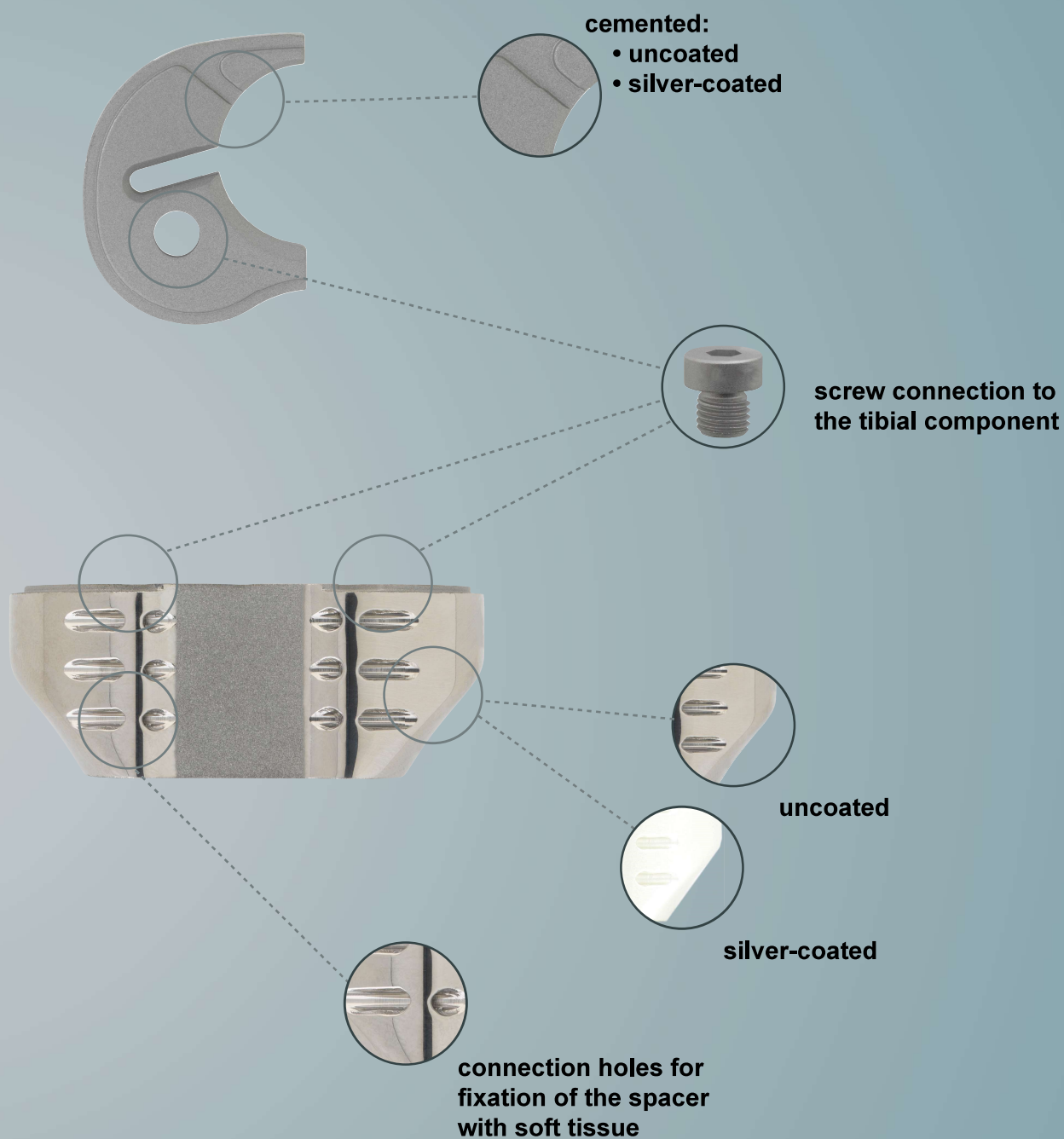


**screw connection to
the femoral component**

	Size range	Material
MK femoral spacer distal*	2 heights (5, 10mm) lateral or medial	implantan®
MK femoral spacer posterior*	2 heights (5, 10mm)	implantan®

* Also compatible to ACS® SC

Tibial spacer



	Size range	Material
MK tibial spacer unicondylar	4 heights (5, 10, 15, 20mm) lateral or medial	implantan® (if need with silver-coating)
MK tibial spacer bicondylar	3 heights (25, 35, 45mm)	implantan® (if need with silver-coating)



Defect Filler

The structure of the EPORE® defect filler is highly porous to maximise contact area and to allow host bone to grow into it for excellent secondary fixation.



The EPORE® product range falls into two main categories:

- **EPORE® metaphyseal components**

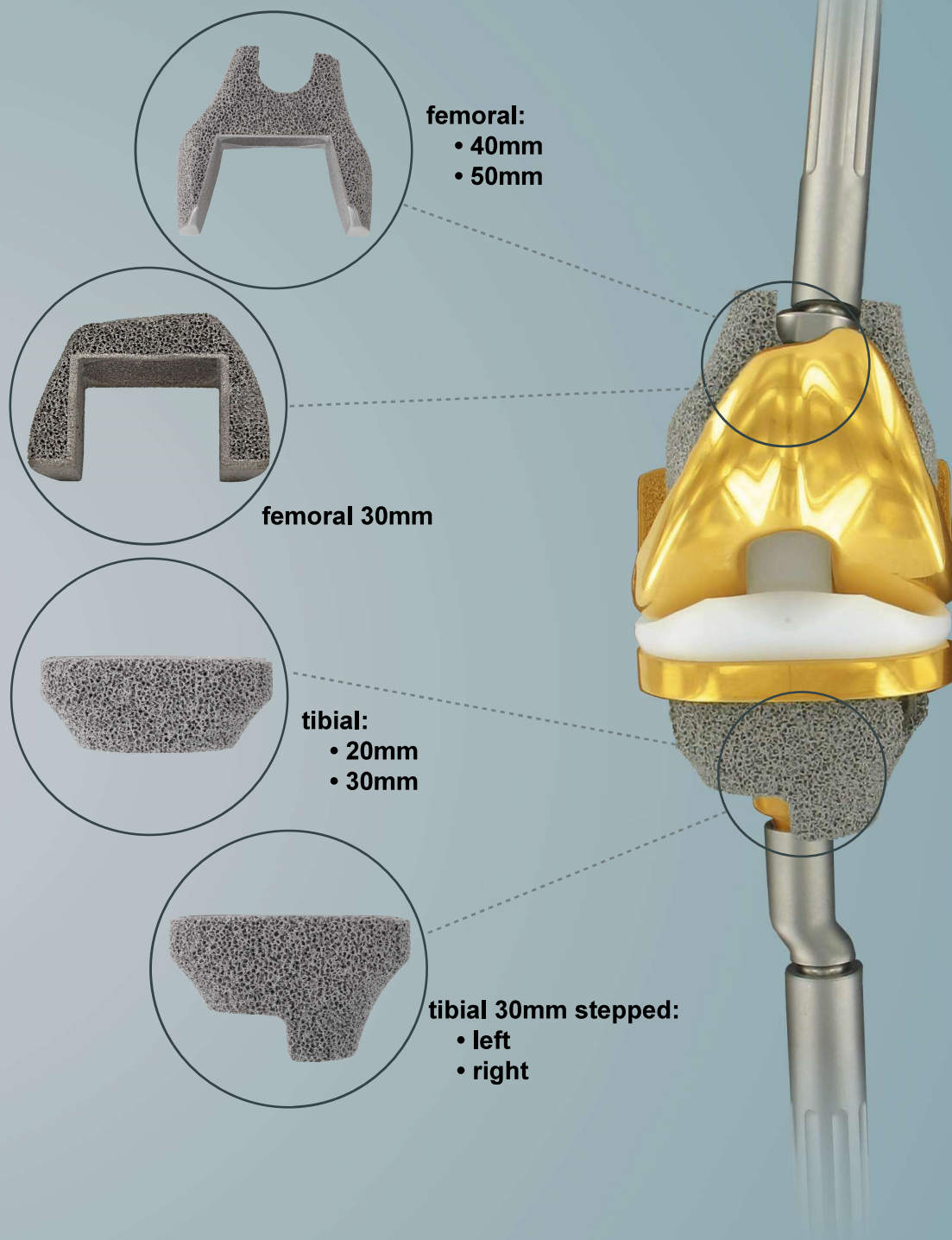
These are a system-specific items for central bone defects of the metaphysis and compatible with ACS® SC and MUTARS® GenuX® MK. The defect filler are fixed to the femoral component and/or tibial component either by screws or by morse taper connections. They are therefore intended for use without bone cement and have stepped bone-facing features to encourage vertical compressive forces for enhanced stability as well as enhanced fixation.

- **EPORE® cones**

These are not usually system-specific items and are thus suitable for use with almost any knee prosthesis. However a special range is available solely for use with the KRI system and with the RS Arthrodesis system. Cones are designed to reinforce weak metaphyseal cancellous and/or weak metaphyseal cortical bone so the outer surface should be in direct stable cementless contact with the host prior. The implant-facing surface should also be well aligned/positioned for final cementation of the femoral component and/or tibial component.

Available as: EPORE® cones cortical
EPORE® cones metaphyseal
EPORE® cones for KRI and RS arthrodesis

Cones Cortical



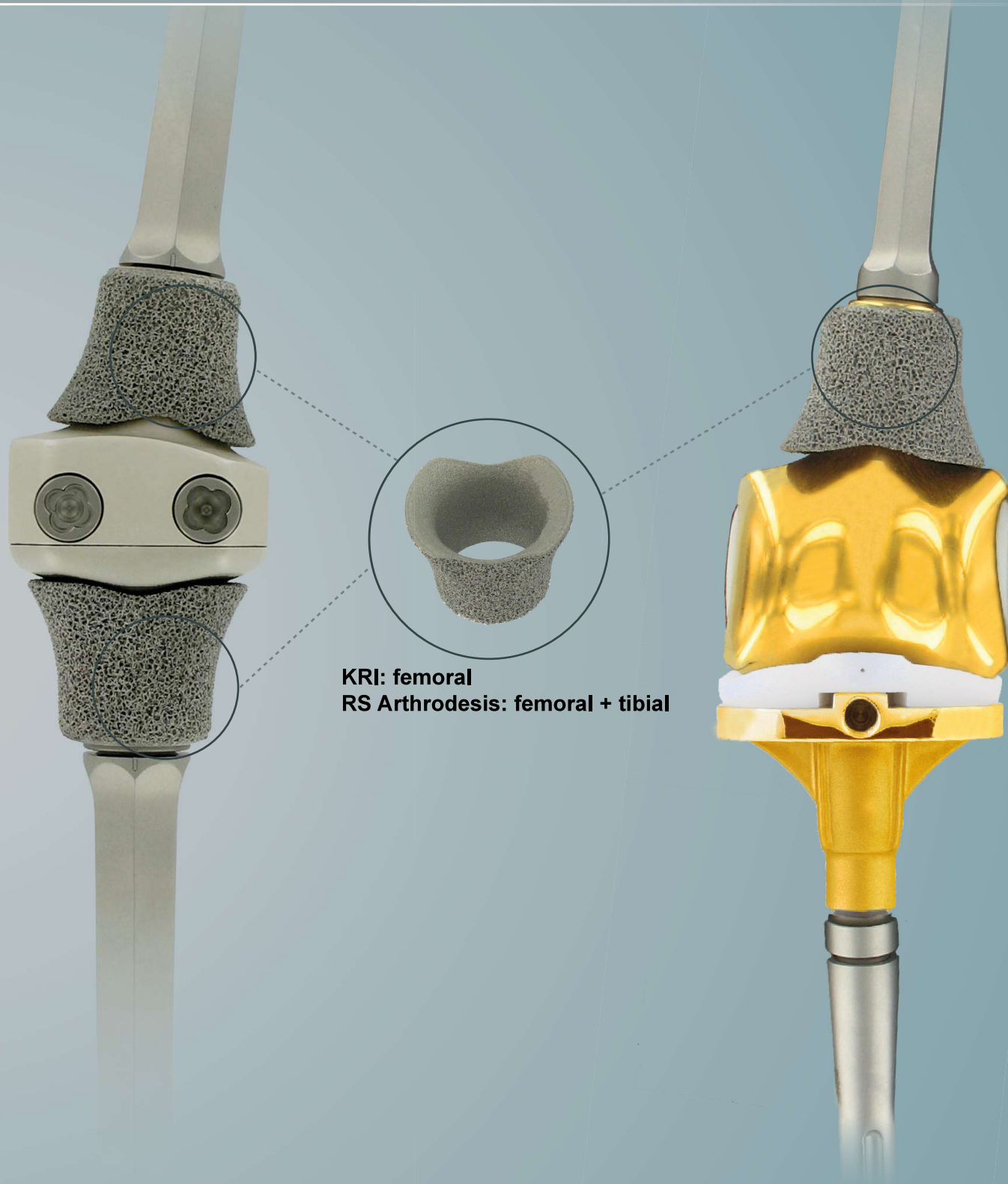
	Size range	Material
femoral	4 sizes Height: 30, 40 and 50mm	EPORE®
tibial	4 sizes Height: 20 and 30mm	EPORE®

Cones Metaphyseal



	Size range	Material
femoral	4 sizes	EPORE®
tibial	4 sizes	EPORE®

Cones KRI & RS Arthrodesis



	Size range	Material
femoral and tibial	3 sizes	EPORE®

Metaphyseal Component

- for ACS[®] MB and GenuX[®] MK -



tibial:
for ACS[®] MB SC and
for GenuX[®] MK



tibial with spacer +5mm/+10mm:
for ACS[®] MB SC and
for GenuX[®] MK

	Size range	Material
femoral	4 sizes	EPORE [®]
tibial	4 sizes	EPORE [®]
tibial with spacer +5mm/+10mm	4 sizes; adapted to the tibial size	EPORE [®]

Metaphyseal Component

- for ACS® FB -



femoral:

- for ACS® SC
- for GenuX® MK



tibial:

for ACS® FB SC



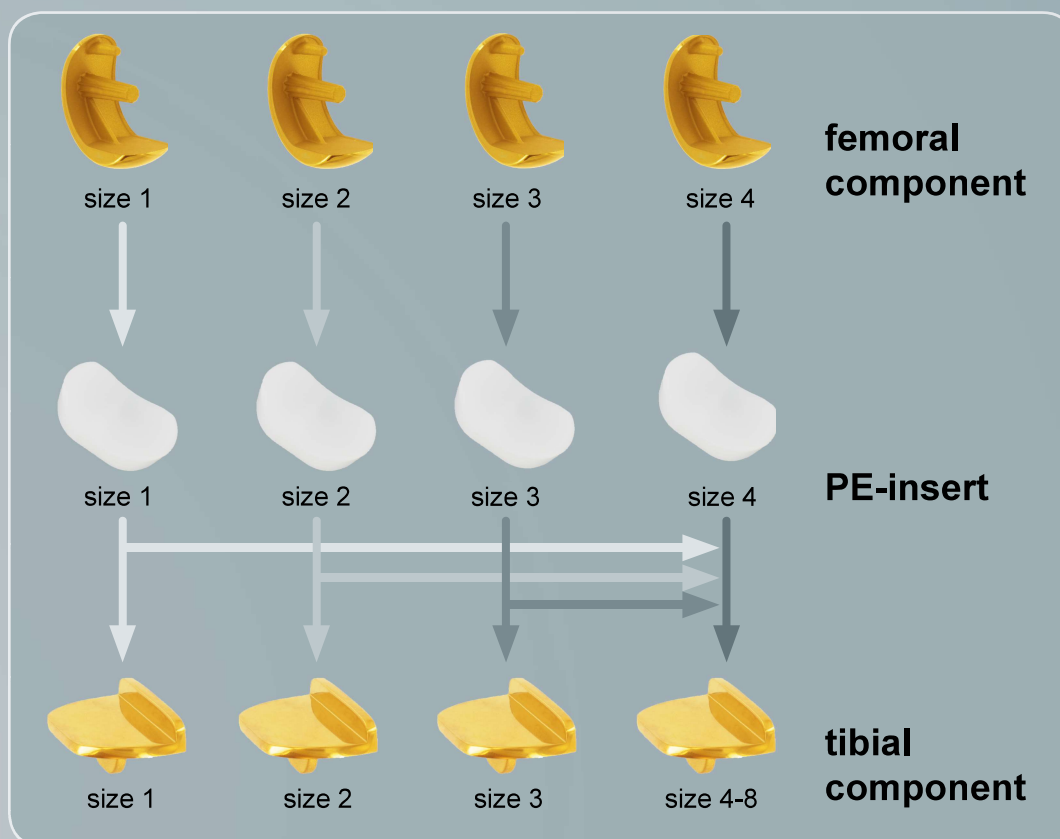
	Size range	Material
femoral	4 sizes	EPORE®
tibial	4 sizes	EPORE®



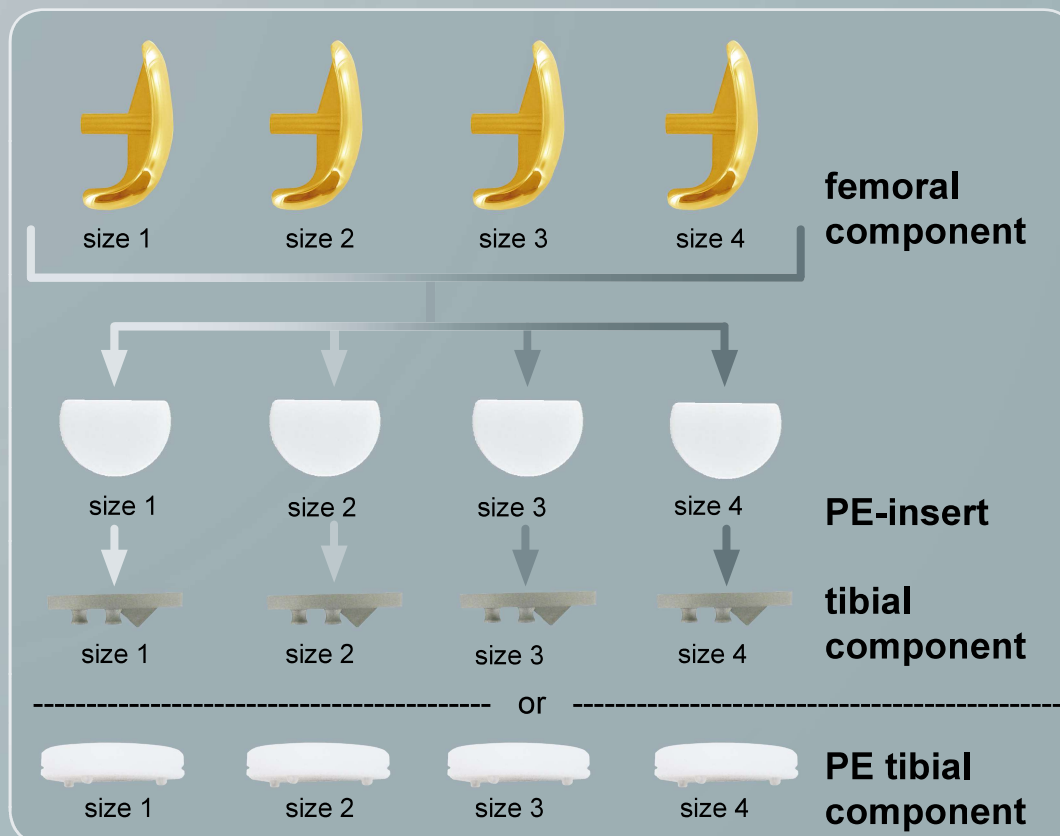
Compatibilities

Compatibility Uni

ACS® UNI

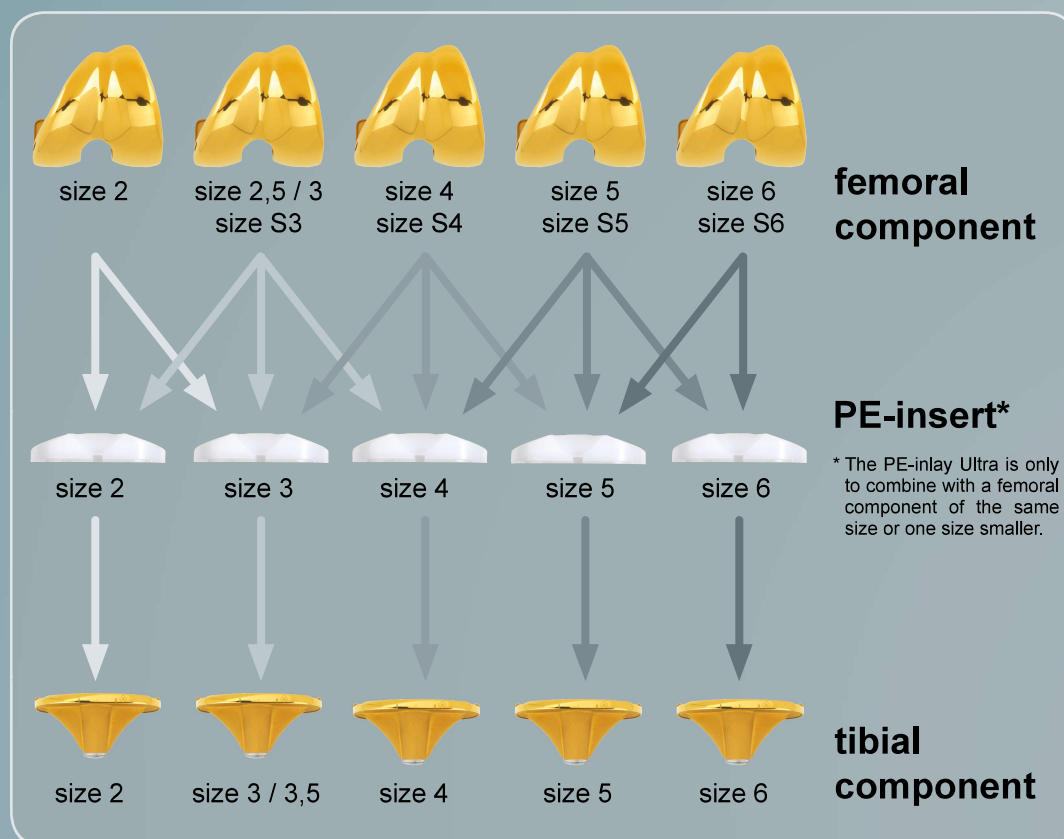


PB UNI

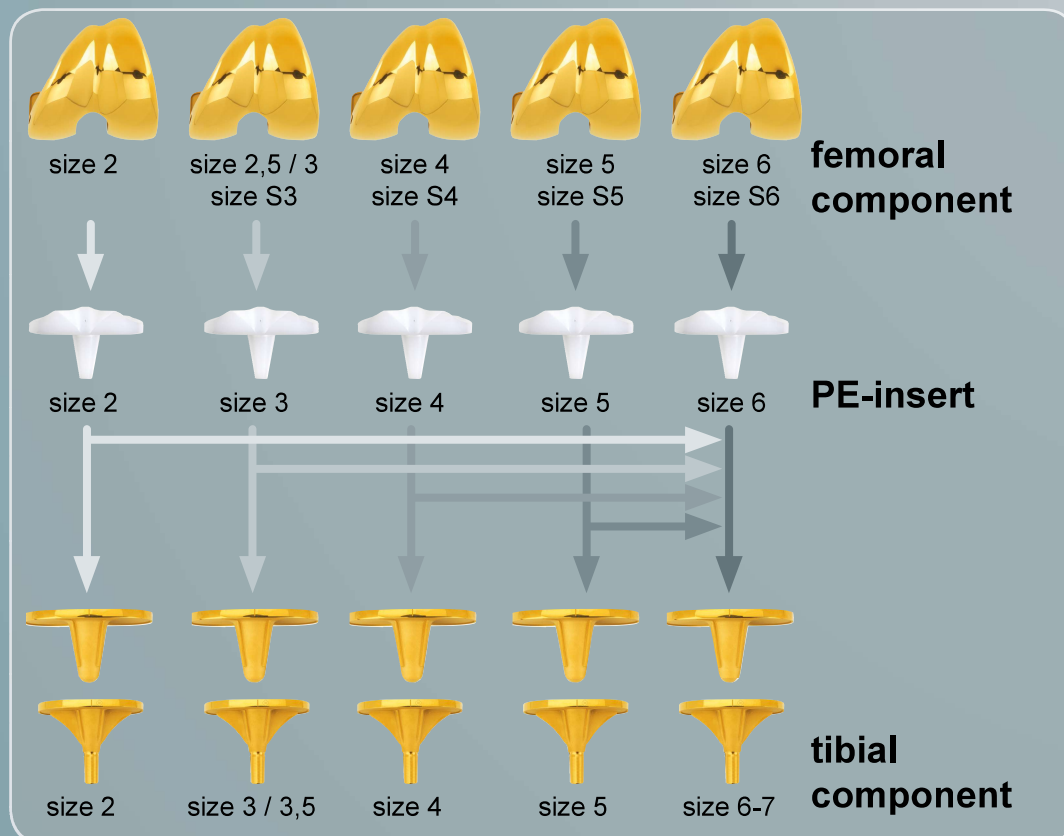


Compatibility ACS®

ACS® FIXED BEARING

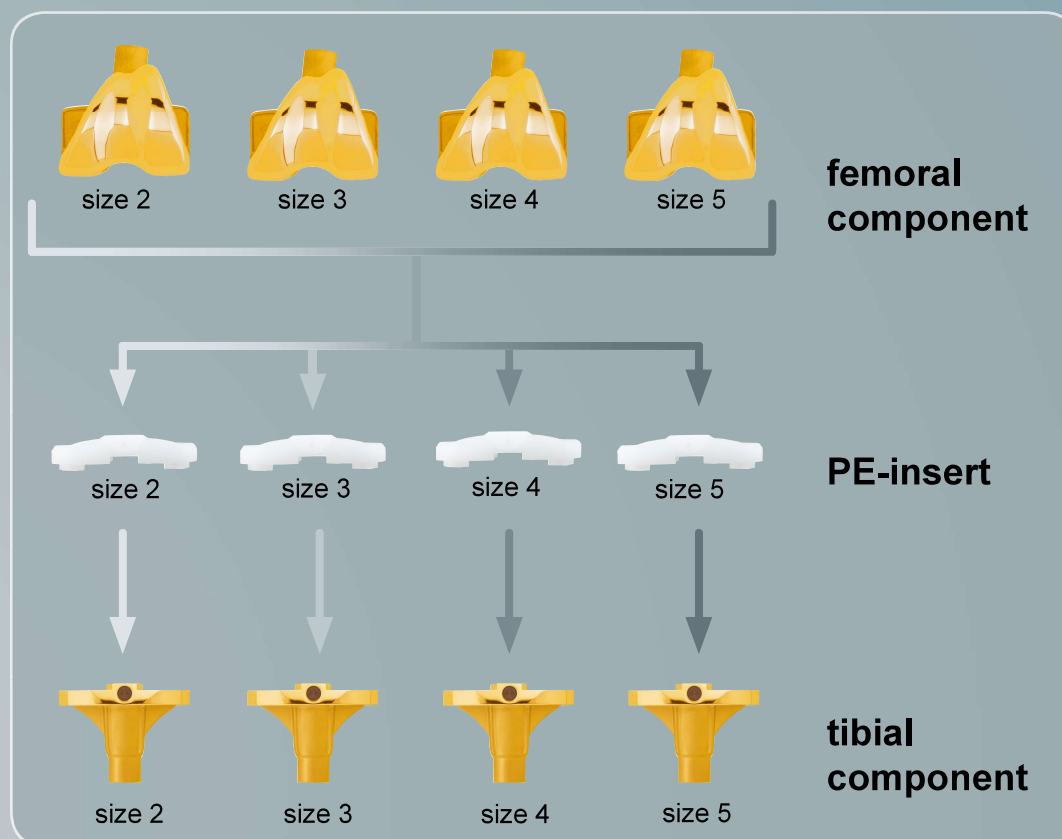


ACS® MOBILE BEARING

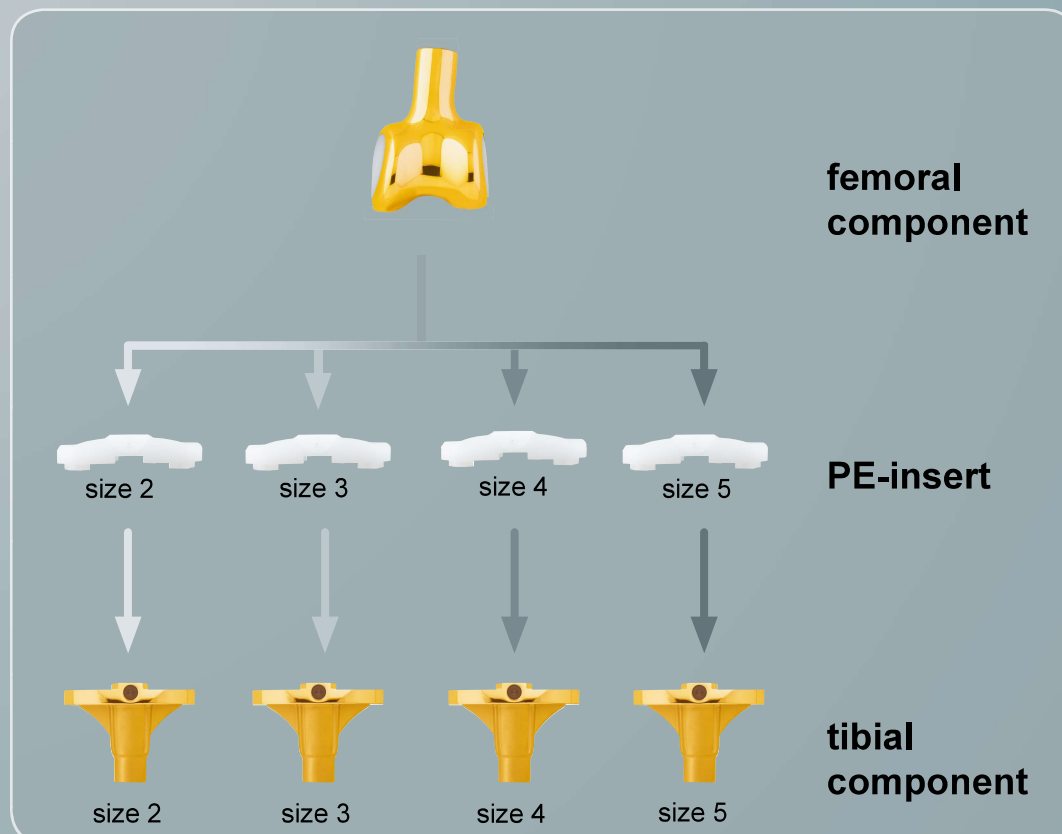


Compatibility MUTARS®

MUTARS® GenuX® MK

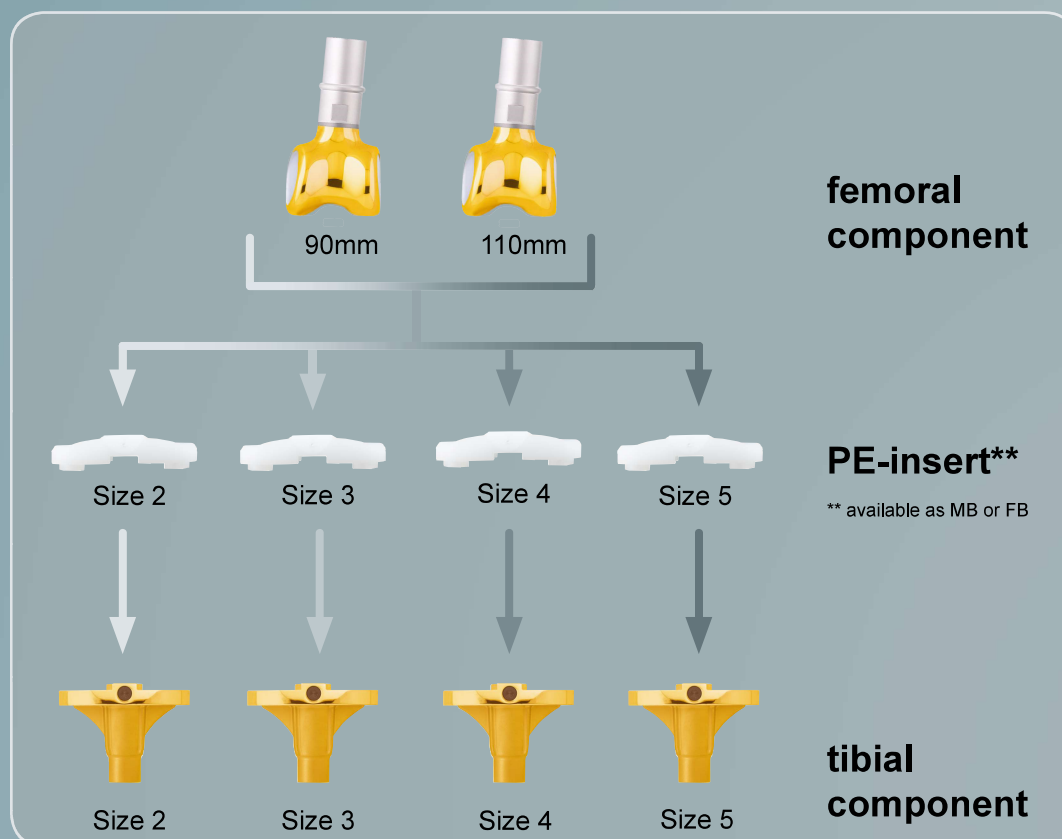


MUTARS® KRI MK

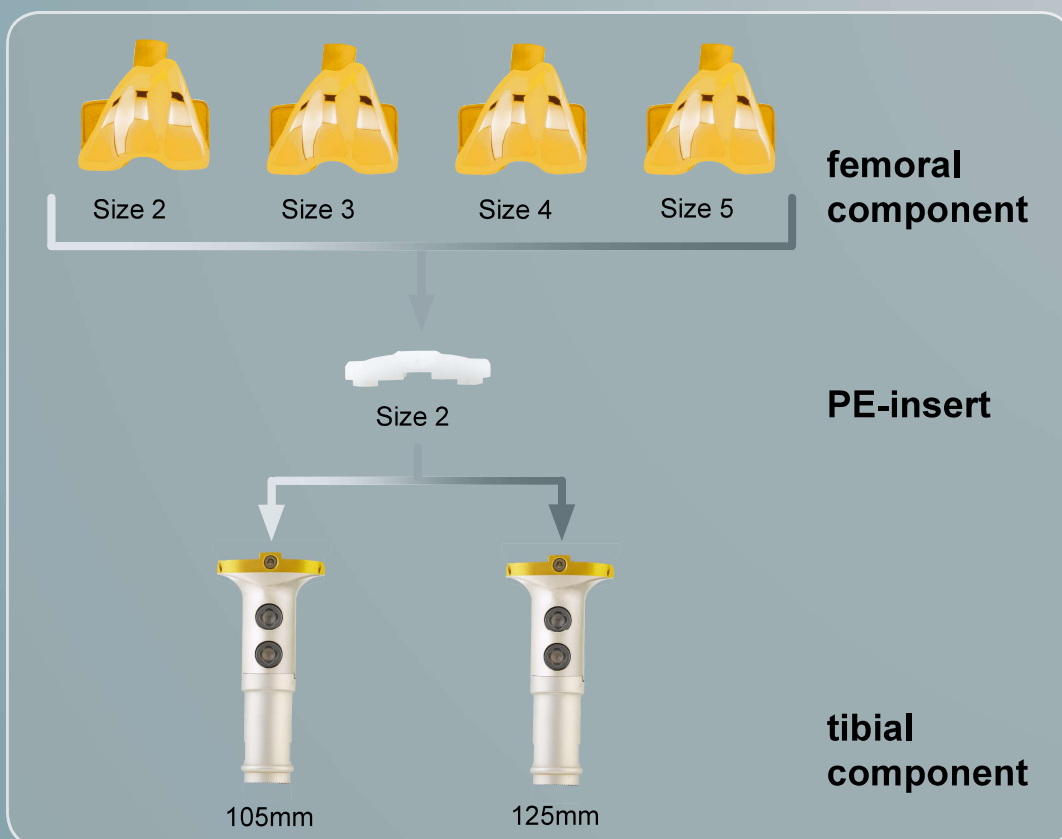


Compatibility MUTARS®

MUTARS® Distal Femur MK

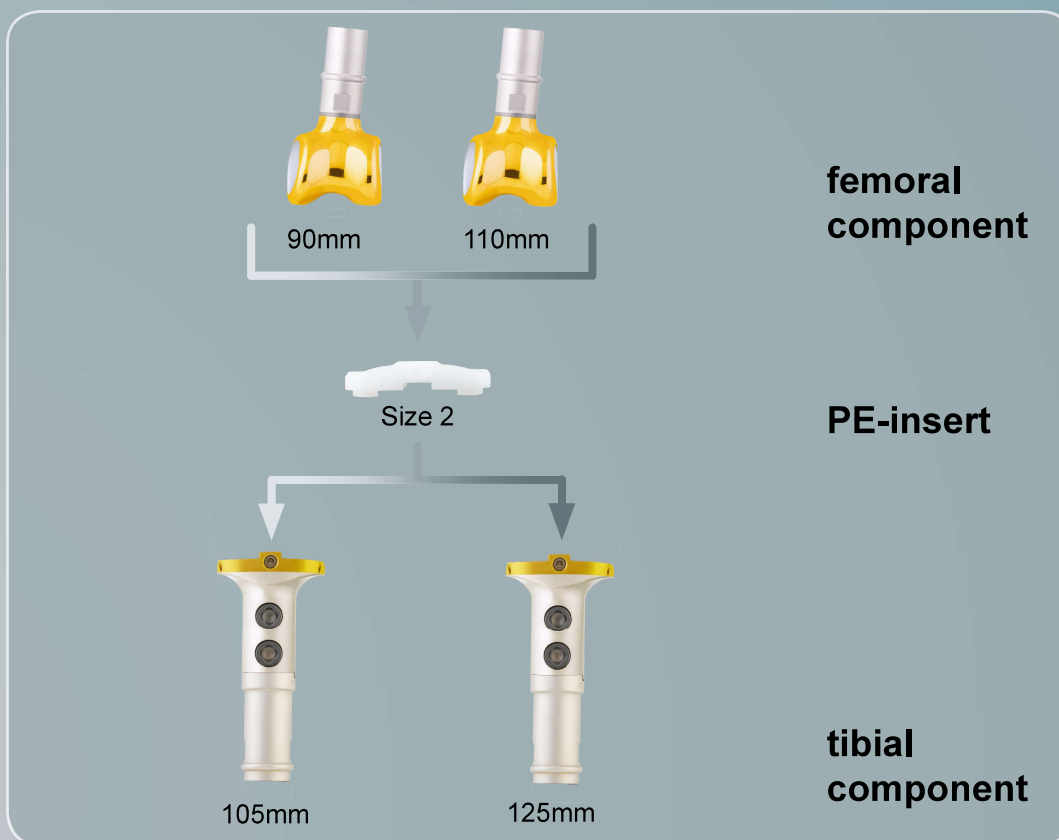


MUTARS® Proximal Tibia MK



Compatibility MUTARS®

MUTARS® Proximal Tibia MK





Materials

Materials Science

- metal components -

implavit® - CoCrMo acc. ISO 5832-4

The articulating femoral, articulating tibial components are made from cobalt chromium molybdenum alloy because of its excellent fatigue behaviour and favourable tribological properties.

The investment casting manufacturing process is used. This is where easily reproducible wax models are assembled to form a pattern clusters which are implant-shaped. The clusters are then coated with a ceramic material by dipping them multiple times in a ceramic fluid before applying ceramic sand to the exterior. The wax pattern clusters are then melted out of the ceramic outer construct. The molten alloy is then introduced and once it has solidified the ceramic exterior is removed so that the cast blank can be inspected for defects.

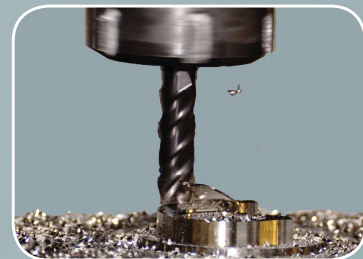
The final steps of the manufacturing: grinding, polishing and barrel finishing. Sometimes coating(s) might then applied but this depends on the specific implant that is being made.



implatan® - TiAl_6V_4 acc. ISO 5832-3

Those ACS® knee components that do not have to articulate with each other such as stems and spacers are made from titanium aluminium vanadium alloy. This material is not only strong but it is also inert due to the formation of an extremely stable oxide outer layer which makes it corrosion resistant and extremely biocompatible. The implantan material also possesses favourable elastic and loading properties when in direct contact with bone.

The raw material is milled and drilled to for the basic implant shape before surface finishing via grinding, polishing and grit-blasting. Again, coating(s) might then applied depending on the specific implant being made.



Materials Science

- EPORE® -

EPORE® porous osseointegrative surface structure

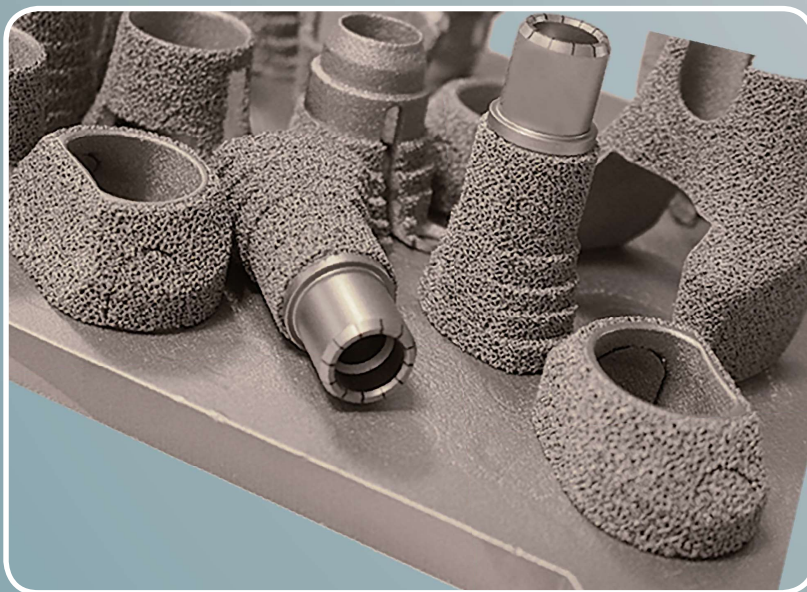
EPORE® implants are also made from titanium aluminium vanadium alloy - for the same reasons as those outlined on the previous page for implantan® components.

mechanical properties	
porosity	ca. 60 %
rod thickness	ca. 330-390 µm
rel. mod. of elasticity	3 GPa*

* tensile measurement

However the implants in the EPORE range are produced via an additive electron beam melting (EBM) manufacturing process. This essentially allows the printing, as it were, of a three-dimensional structure that can be highly complex (i.e. for customs and/or for defect filling) and porous (i.e. scaffold-like for osteointegration where desired) as well as solid, so to speak, (i.e. for attaching to instruments and connecting to other implants).

Every item is digitally edited prior to the fully-automated EBM production process - which builds the implant layer-by-layer. A thin layer of powdered alloy is placed on the EBM building platform then a high energy electron beam moves along the powder fusing it locally to form an "implant slice". The platform is lowered, the next thin layer of powdered alloy is placed upon it and the electron beam fuses the next "implant slice" to the one made in the previous cycle. This is repeated until the component is completely built then the implant is finished by machining and inspected.



Materials Science

- PE sliding surface-

UHMWPE acc. ISO 5834-2

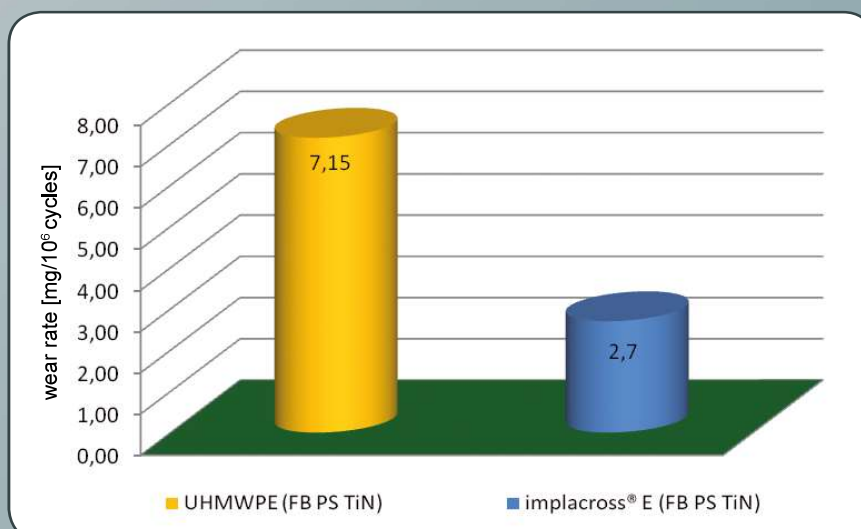
The components of knee endoprotheses that have gliding articulating surfaces (i.e. patellae and tibial inserts) are all made from ultra high molecular weight polyethylene (UHMWPE).

The raw material is in powder form and is made into a puck via a compression moulding process which takes place at high temperature and high pressure. Subsequent heat-treatment reduces the stresses within the sintered puck which is then milled into the desired implant shape prior to wrapping and sterilising with ethylene oxide.

implacross® E

This is a vitamin E stabilised UHMWPE option.

Here the raw material is GUR1020 acc. 5834-1 which is infused with 1000 ppm of Vitamin E (which is safe as it forms part of the natural human diet and is a collective term for all tocopherols and tocotrienols¹). The manufacturing process is similar to that outlined above for standard UHMWPE but the sintered and heat-treated pucks are gamma-irradiated (with a dose of 50kGy) to cross-link the hydrocarbon molecules in three dimensions which improves wear resistance and extends implant longevity. The vitamin E present in the structure effectively neutralises the free radicals that can be left behind following the application of the gamma beam to prevent oxidative degeneration according to simulator tests.



wear test acc. DIN ISO 14243 ^{2,3}

Coatings

- titanium nitride-

TiN - coating

The articulating femoral and tibial components of the ACS range are coated with titanium nitride (TiN) as standard as this has several key advantages. The ceramic TiN coating is applied via a process called physical vapour deposition (PVD) to modify only the surface properties of the implant in such a way as to improve wear characteristics (i.e. implant longevity) and biocompatibility (i.e. reduce the incidence of allergy). PVD deposition of a TiN-coating does not affect the underlying component substrate material in any way.

Coating in case of metal allergy

TiN coating to reduce the incidence of allergy:

A small amount of highly allergenic nickel (Ni) can be found in all CoCrMo alloy components. The emission of allergenic ions such as trace Ni, substrate Cr (which is also highly allergenic) and substrate Co is significantly reduced by coating the surface with TiN⁴ to undetectable levels⁵ making TiN-coated implants ideal for patient who have (or indeed may have) sensitivity to certain metal ions⁶.

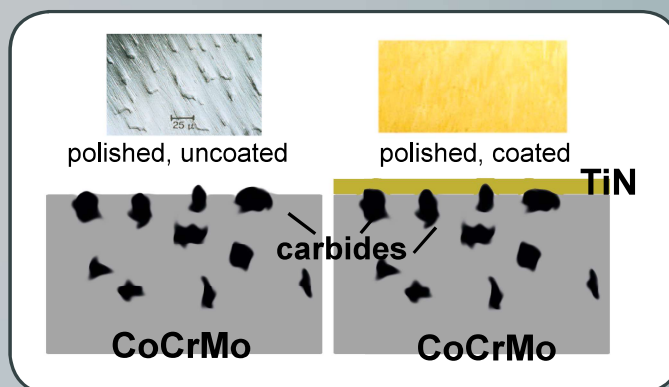


properties of TiN ⁷	
biocompatibility	excellent
abrasion behaviour	low-friction articulation + high scratch resistance low friction coefficient in contact with UHMW-PE
layer thickness	1-10µm
roughness (Ra)	≤ 0.05µm
adhesive strength	extremely high (HF 1-2)
layer hardness	~ 2,300 HV (4 times higher than the hardness of cobalt chrome alloys)
colour	golden yellow
wettability	high wettability with synovial liquid
allergy potential	reduced due to the reduction of released ions

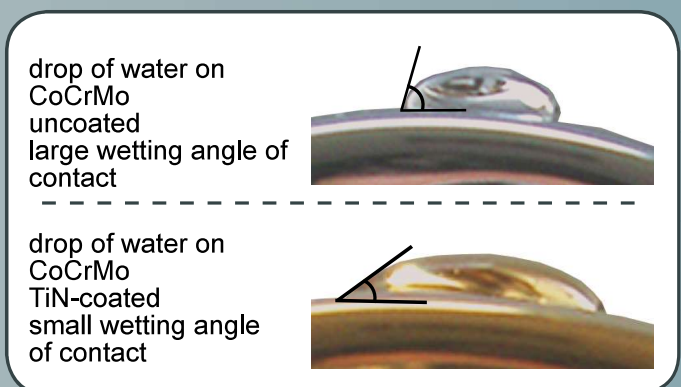
Wear reduction by TiN

TiN coating to reduce implant wear:

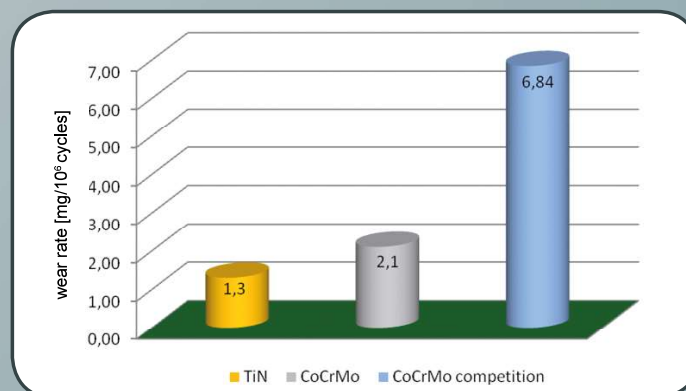
While the carbides formed during the production of CoCrMo alloy increase/improve hardness they also protrude from implant surfaces and tend to increase cyclical wear of their articular partner - which can lead to early aseptic failure. The covering or masking of these surface carbides with the harder TiN-coating reduces this wear⁸ thereby extending implant life. Additionally the highly wettable ceramic TiN-coating reduces articular friction. Plus the coating can even tolerate the presence of particles of bone cement without delaminating⁹.



reduced abrasion due to TiN-coated carbides



wettability of ACS® femoral component



wear test acc. DIN ISO 14243^{10,11}

Coatings

- fixations -

Bone quality and patient fitness are important factors to consider when choosing between the (almost) immediate mechanical fixation achieved via the use of bone cement and the longer term more biological fixation with cementless devices. If cementless fixation is indicated then primary intra-operative stability is essential - as is implant surface structure and/or coating in terms of osteointegration.

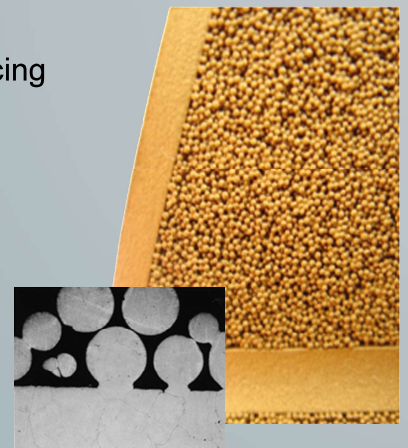
cemented

Cemented femoral implants and cemented tibial implants feature 0.7mm deep cement pockets to provide secure fixation with bone cement.



cementless porous coating (pc)

Here three layers of 300µm CoCrMo balls are sintered to the bone-facing surface of the implant to enhance osteointegration.



cementless cpTi/TCP

This is a two-stage process. Firstly a rough and porous coating of commercially pure titanium (cpTi) is applied for primary mechanical on-table fixation. Next a layer of tricalcium phosphate (TCP) is added to encourage/accelerate osteogenesis.



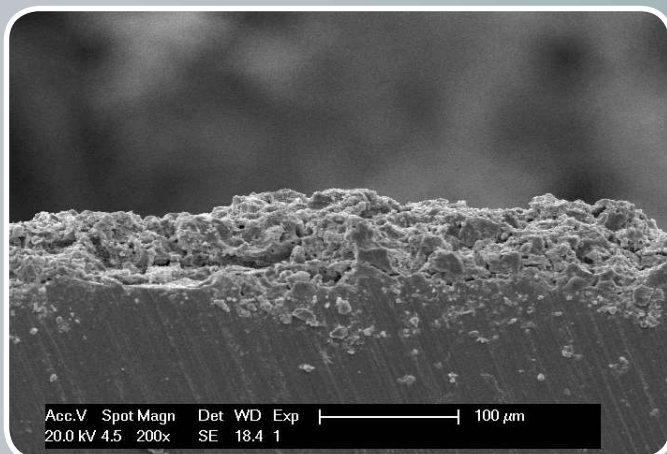
Coatings

- hydroxyapatite-

implaFiX® HA acc. ISO 13779

The bioactive implaFiX® HA cementless stem coating is used to accelerate the required/desired chemical bond between the implant surface and cortical/cancellous bone.

The implant surface is cleaned and roughened by grit-blasted prior to plasma spraying with hydroxyapatite (HA) - to increase the adhesive strength of the applied HA-coating. The device is then cleaned and inspected.



detailed view of implaFiX® HA coating
(650x increase)



detailed view of implaFiX® HA coating
(200x increase)

Coatings

- silver -

Infections are the most serious complication in the field of tumor endoprothetics. The literature shows infection rates of 5-35%¹² although adequate local and systemic antibiotic prophylaxis has been done. The lifetime of endoprosthesis in-vivo is mainly limited by septic and aseptic loosening. Together with the university hospital Munster implantcast developed a unique silver coating which is used on components of the MUTARS® system since 2004.

Silver, especially free silver ions, are known for their large antimicrobial spectrum. Thus a reduced occurrence of bacterial colonies can be observed on silver coated components. The risk of infections and following loosening mechanisms are reduced like this and revision surgeries or amputations due to infections can be avoided. Two of the advantages of silver coating compared to coatings containing antibiotics are the continuous and longterm antimicrobial effect of silver ions and the more complicated development of resistance. The efficacy of the silver coating could be approved in clinical use¹³⁻¹⁷.

By now every implant surface can be coated with silver as long as those areas do not have direct bone contact or participate in the articulation of the prosthesis. Over 12,500 treatments with silver coatings have been implanted so far.

advantages of silver coating

- reduced rates of infection
- long-term prophylaxis due to intelligent release of silver ions
- reduced likelihood of bacterial resistance
- proven in the clinical setting



Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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